

TETRA TECH, INC.

TECHNICAL MEMORANDUM

Basewide Groundwater Monitoring Program Report
Winter 2006 (Q1)
Installation Restoration Program Site 5 Cluster
Vandenberg Air Force Base, California

09 June 2006

Prepared by:
Tetra Tech, Inc.
4213 State Street, Suite 100
Santa Barbara, California 93110

1.0

INTRODUCTION

This report documents the activities and results of the winter 2006 groundwater monitoring at Installation Restoration Program (IRP) Site 5 Cluster, Operable Unit 5, Vandenberg Air Force Base (AFB), Santa Barbara County, California. The Site 5 Cluster comprises Site 5 (Space Launch Complex [SLC] 3 East [3E] and the unnamed tributary), Site 6 (SLC 3 West [3W]), and Site 7 (Bear Creek Pond and a portion of Bear Creek Canyon). Tetra Tech, Inc. (Tetra Tech) collected groundwater samples at the Site 5 Cluster during March 2006. The location of the Site 5 Cluster is shown on Figure 1.

The groundwater monitoring is being completed in accordance with the Basewide Groundwater Monitoring Program (BGMP) Work Plan (Tetra Tech 2000a), the BGMP Work Plan Addendum for Site 5 Cluster (Tetra Tech 2002), the BGMP Health and Safety Plan Addendum (Tetra Tech 2000b), the Basewide Sampling and Analysis Plan (Tetra Tech 2003), the BGMP Quality Assurance Project Plan (QAPP) Addendum (Tetra Tech 2004), the Vandenberg AFB Hazardous Waste Management Plan (U.S. Air Force 2002), and the Waste Management Plan Addendum (Tetra Tech 2005a). Regulatory oversight of the work is being performed by the California Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board—Central Coast Region (RWQCB).

Site background information is summarized in Section 2.0. The scope of work and methodology for groundwater monitoring are presented in Section 3.0. The results of the groundwater monitoring are presented in Section 4.0. Quality Assurance/Quality Control is discussed in Section 5.0. Recommendations for future sampling are presented in Section 6.0.

A complete description and history of the Site 5 Cluster and the results of previous environmental investigations can be found in the electronic version of the Draft Remedial Investigation Report (Tetra Tech 2005b).

2.0

BACKGROUND

2.1

SITE DESCRIPTION

The IRP Site 5 Cluster comprises Site 5 (SLC 3E), Site 6 (SLC 3W), and Site 7 (Bear Creek Pond) (Figure 1). The Site 5 Cluster is located on south Vandenberg AFB in the Lompoc Terrace physiographic region south of Bear Creek Road and east of Coast Road.

Site 5 consists of a missile launch pad, a retention basin and associated deluge water channel, and support and control centers. Site 5 also encompasses a portion of Bear Creek Canyon and the unnamed tributary to Bear Creek Canyon located south-southeast of the SLC 3E missile launch pad (Figure 1). A total of 30 Atlas missiles have been launched from SLC 3E. The Atlas missile engines were flushed with trichloroethene (TCE) prior to fueling. TCE engine flushing and possibly other degreasing activities have resulted in releases of TCE to groundwater at the site. The first missile was launched on 12 July 1961, and the most recent missile was launched during December 2003. Launch deluge water was channeled away from the pad to a retention basin. Historically, the deluge water was discharged into the unnamed tributary to Bear Creek, southeast of the site, but this practice has been discontinued. The SLC 3E launch pad is currently being modified to launch a new Atlas 5 missile.

Site 6 consists of the former SLC 3W launch facility, which was demolished on 22 January 2000. The remaining launch pad and single-level, concrete building are located on the northeastern slope of Bear Creek Canyon, approximately 1,200 feet northwest of the intersection of Napa and Alden Roads (Figure 1). Eighty-four missiles were launched from SLC 3W from 11 October 1960 through 24 March

1995. Launch deluge water from the site was channeled away from the pad to a retention basin and was discharged toward Bear Creek Canyon.

Site 7 is located within a northwest-trending canyon southwest of Bear Creek Road and west-northwest of Sites 5 and 6 (Figure 1). The site includes Bear Creek Pond (a federally designated wetland that covers approximately 0.25 square mile), the portion of Bear Creek Canyon between SLC 3 and the pond, and the drainage channels adjacent to the southern edge of Site 6. The site's eastern edge is adjacent to Sites 5 and 6.

The primary contaminants of concern (COCs) in groundwater from the Site 5 Cluster are TCE and its breakdown products, which have been detected at concentrations above maximum contaminant levels (MCLs). Additional COCs have included metals, one of which is hexavalent chromium. Groundwater samples collected by Tetra Tech during the remedial investigation did not contain semivolatile organic compounds (other than phthalate esters), total petroleum hydrocarbons, or polynuclear aromatic hydrocarbons (Tetra Tech 2005b).

2.2 HYDROGEOLOGY

Sites 5, 6, and 7 are located in the central portion of the Lompoc Terrace sub-basin, bordered on the north by the Santa Ynez River and on the south by the Santa Ynez Mountains. Sites 5 and 6 overlie a paleo-marine terrace and are bordered on the south and west by slopes and drainages including an unnamed tributary to Bear Creek, which drains to the west into Bear Creek, and Bear Creek proper, which drains northwesterly into Bear Creek Pond (Site 7). Perennial surface water is limited to Bear Creek Pond and seeps along Bear Creek Canyon, located within approximately 2,500 feet of Bear Creek Pond. Sites 5 and 6 have no perennial surface water. Ephemeral surface water may exist at each site in the form of locally ponded precipitation or runoff in the unnamed tributary and Bear Creek.

Groundwater occurs beneath SLC 3E and SLC 3W in silts of the Careaga Formation, at depths of approximately 180 to over 300 feet below ground surface (bgs). Groundwater occurring within the Careaga Formation has been separated into three zones: the shallow groundwater zone, intermediate groundwater zone, and the deep groundwater zone (Tetra Tech 2005c). Recharge to Site 5 Cluster groundwater is primarily from creek discharge of Bear Creek Canyon located to the southeast.

Groundwater occurs beneath the unnamed tributary to Bear Creek above a clayey sand layer that may serve as a perching unit in what has been designated the perched groundwater zone. Recharge to the unnamed tributary is from seasonal flow and discharge is to Bear Creek Canyon to the west. Groundwater elevations in wells installed at the unnamed tributary (5-MW-1, 5-MW-3, 5-MW-5, and 5-MW-6) exhibit marked fluctuations depending on the season.

Groundwater beneath Bear Creek Canyon exists at relatively shallow depth in what has been designated the alluvial groundwater zone (generally within 30 feet of ground surface) and is fed from the portion of Bear Creek south of Site 5 Cluster, which is underlain by shale bedrock of the Monterey Formation.

Groundwater levels measured in March 2006 indicate groundwater elevations ranged from approximately 63 to 281 feet above mean sea level (msl) (Table 1). During winter 2006 the interpreted direction of groundwater flow at Site 5 Cluster was to the northwest with an average hydraulic gradient of 0.02 feet per foot (Figure 1).

3.0 SCOPE OF WORK

The work performed for the winter 2006 groundwater monitoring at the Site 5 Cluster included measuring groundwater levels, collecting groundwater samples for laboratory analysis, and preparing this report.

3.1 GROUNDWATER MONITORING METHODOLOGY

Eleven wells were sampled at Site 5 Cluster during winter 2006. MicroPurge pumps and a Grundfos pump were used for purging groundwater at wells 5-MW-4, 5-MW-7 (T and B), 5-MW-11, 5-MW-15, 5-MW-17, 5-MW-18, 5-MW-20, 5-MW-21, 5-MW-23, 6-MW-1, and 6-MW-3. Discrete groundwater samples were taken from the top and bottom of the screened interval from well 5-MW-7. A duplicate sample was collected from well 5-MW-18. Wells 5-MW-5 and 5-MW-6 were dry and were not sampled. Sampling was conducted in accordance with the documents cited in Section 1.0. Measured groundwater elevations are presented in Table 1, and groundwater contours are illustrated on Figure 1. Purge records are provided in Appendix A.

In general, wells were purged until a minimum of one pump and tubing volume of water (for MicroPurge pumps) or a minimum of three well volumes of water (for Grundfos pumps) were removed and water quality parameters had stabilized. Criteria for determining stabilization are three successive measurements of temperature within ± 1 degree Celsius, pH within ± 0.1 , conductivity within ± 5 percent, and a turbidity reading of less than 5 nephelometric turbidity units (NTUs). In cases where stability or a turbidity reading of less than 5 NTUs was not obtained, samples were collected after purging a minimum of five pump and tubing volumes of water (for MicroPurge pumps) or a minimum of five well volumes of water (for Grundfos pumps).

3.1.1 MicroPurge Groundwater Sampling

MicroPurge sampling was conducted at monitoring wells 5-MW-4, 5-MW-7 (T and B), 5-MW-11, 5-MW-15, 5-MW-17, 5-MW-18, 5-MW-20, 5-MW-21, 5-MW-23, and 6-MW-3. Pumping rates were calibrated for each well prior to purging to maintain a static water level (i.e., no drawdown). Due to high turbidity, wells 5-MW-7(T) and 5-MW-21 were sampled after purging at least five pump and tubing volumes of water.

3.1.2 Standard Groundwater Sampling

A 2-inch Grundfos pump was used for purging groundwater at monitoring well 6-MW-1. The sample was collected using a disposable Teflon bailer. Due to high turbidity, well 6-MW-1 was sampled after purging five well volumes of water.

4.0 RESULTS

Temperature, conductivity, pH, and turbidity were measured in the field during purging and sampling. Readings measured immediately prior to sampling are presented in Table 2. Additionally, dissolved oxygen (DO), ferrous iron (Fe II), and oxidation-reduction potential (ORP) were measured during purging at monitoring wells where natural attenuation parameters were measured. These measurements are also presented in Table 2. Fixed laboratory analyses were performed by EMAX Laboratories, Inc. in Torrance, California. Samples were analyzed according to the work plan (Tetra Tech 2000a) for hexavalent chromium by U.S. Environmental Protection Agency (EPA) method E218.6, volatile organic compounds (VOCs) by EPA method SW8260B, and water quality parameters by EPA methods E300.0, E310.1, E353.3, E376.2, E415.1, and RSK175. Laboratory analyses and data validation were conducted

according to the QAPP Addendum (Tetra Tech 2004a). Data validation was performed on 100 percent of the analytical data. Results are presented in Tables 2 through 4 and on Figure 2. Historical data for key COCs are presented in Table 5 and on Figures 3A and 3B. Figure 3A contains historical data for key COCs from January 2002 through spring 2004 and Figure 3B contains historical data for key COCs for summer 2004 through the present. Hydrographs showing historical TCE and *cis*-1,2-dichloroethene (DCE) concentrations for wells 5-MW-7 (T and B), 5-MW-15, 15-MW-18, 5-MW-20, and 6-MW-3 are presented on Figure 4. Chain-of-custody records are provided in Appendix B.

4.1 MONITORED NATURAL ATTENUATION

Numerous physical and chemical groundwater parameters were measured to assess the potential for intrinsic biodegradation of chlorinated aliphatics. Selected parameters measured in the field and used in the natural attenuation evaluation include pH, DO, ORP, temperature, and Fe II. The chemical parameters analyzed by fixed laboratory analysis include chloride, nitrate, sulfate, alkalinity (as calcium carbonate), total organic carbon (TOC), total sulfide, ethane, ethene, and methane.

Chlorinated aliphatic hydrocarbons will intrinsically biodegrade only under certain environmental (*in situ*) chemical conditions. Anaerobic conditions (low DO) are favorable for the initial degradation of TCE and its daughter products (*cis*-1,2-DCE, *trans*-1,2-DCE, and 1,1-DCE). Low nitrate (<1 milligram per liter [mg/L]) and low ORP values (<50 millivolts) greatly increase the possibility of degradation. High values of Fe II (>1 mg/L), TOC (>20 mg/L), and the presence of ethane, ethene, and methane indicate subsurface conditions potentially favorable for the natural attenuation of chlorinated aliphatics (U.S. EPA 1998).

The highest concentrations of TCE have been detected in groundwater from wells 5-MW-7 and 5-MW-18 (Table 6). Well 5-MW-7 is located downgradient of the deluge pipe leading from the retention basin for SLC 3E. Groundwater from this well has had an average TCE concentration of approximately 4,023 micrograms per liter ($\mu\text{g}/\text{L}$) since January 2002. Well 5-MW-18 is outside of the SLC 3W fenceline and downgradient from the retention basin. Groundwater from this well has had an average TCE concentration of approximately 4,247 $\mu\text{g}/\text{L}$ since January 2002.

Samples from wells 5-MW-15 and 5-MW-18 were analyzed for selected natural attenuation parameters (Table 2). Groundwater samples from these wells had an average DO concentration of 1.17 mg/L, a low average ORP of -70.1 millivolts, low average total organic carbon concentrations (1.05 mg/L), low average nitrogen as nitrite and nitrate concentrations (0.77 mg/L), and high Fe II (2.0 mg/L), in one well (5-MW-15) indicating mixed subsurface conditions. However, the most direct evidence of intrinsic degradation of TCE in the Site 5 Cluster groundwater plume area is the consistent presence of all three degradation daughter products (*cis*-1,2-DCE, *trans*-1,2-DCE, and 1,1-DCE).

4.2 HEXAVALENT CHROMIUM

Groundwater samples from shallow zone wells 5-MW-7 (T and B) and 6-MW-3 were analyzed for hexavalent chromium. Concentrations detected ranged from 7.88 to 11.7 $\mu\text{g}/\text{L}$; hexavalent chromium was detected in groundwater from all three samples (Table 3 and Figure 2). Concentrations were similar to those detected during previous quarters (Table 5).

4.3 VOLATILE ORGANIC COMPOUNDS

Groundwater samples collected from wells 5-MW-4, 5-MW-7 (T and B), 5-MW-11, 5-MW-15, 5-MW-17, 5-MW-18, 5-MW-20, 5-MW-21, 5-MW-23, 6-MW-1, and 6-MW-3 were analyzed for VOCs. Volatile organic compounds were detected in groundwater from 8 wells (Table 4 and Figure 2).

Trichloroethene was detected above the MCL of 5 µg/L in groundwater from 7 wells. The highest concentrations were detected in groundwater from shallow zone wells 5-MW-7 (T and B) and 5-MW-18 at concentrations of 4,500, 4,600, and 4,600 µg/L (4,000 µg/L in the duplicate sample), respectively. The compound *cis*-1,2-DCE was detected above the MCL of 6 µg/L in groundwater from 5 wells. The highest concentration (2,000 µg/L) was detected in groundwater from shallow zone well 5-MW-15. Most TCE and *cis*-1,2-DCE concentrations were detected in the shallow and perched groundwater zones. TCE was detected in perched zone wells sampled. These concentrations were similar to those previously detected with the following exceptions (Table 5 and Figures 3A and 3B). TCE concentrations have been steadily decreasing in groundwater from well 5-MW-17 (Table 5). TCE concentrations have been steadily increasing in groundwater from well 5-MW-20 (Figure 4). The TCE concentrations detected in groundwater from wells 5-MW-17 and 5-MW-20 represent a historical low and a historical high, respectively. Concentrations of *cis*-1,2-DCE have been steadily increasing in groundwater from well 5-MW-7 (T and B), and the compound was detected for the first time during winter 2006 (Figure 4).

Figure 4 shows hydrographs of groundwater elevations and TCE and *cis*-1,2-DCE concentrations for wells 5-MW-7 (T and B), 5-MW-15, 5-MW-18, 5-MW-20, and 6-MW-3. There is a moderate correlation between TCE concentrations and rising groundwater elevations in wells 5-MW-20 and 6-MW-3 and a moderate inverse correlation between groundwater elevations and TCE concentrations in groundwater from wells 5-MW-7T and 5-MW-7B.

A review of TCE concentrations in groundwater from well 5-MW-15 indicate an increasing trend since winter 2003 and a review of *cis*-1,2-DCE concentrations indicate a generally decreasing trend during the same time period. A review of TCE and *cis*-1,2-DCE concentrations in groundwater from well 5-MW-18 indicated TCE concentrations show no apparent trends, and *cis*-1,2-DCE concentrations have generally remained stable during this same time period. A review of TCE concentrations in groundwater from well 6-MW-3 indicated an overall increasing trend since January 2002; however, TCE concentrations in groundwater from well 6-MW-3 decreased from 2,700 µg/L during winter 2005 to 1,800 µg/L during summer and fall 2005 before increasing slightly to 2,100 µg/L during winter 2006.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

All of the analytical data presented in this report have been validated according to the QAPP Addendum (Tetra Tech 2004). The data validation process includes review of sample preservation, temperature, and hold times; detection and quantitation limits; instrument calibration; and equipment blank, trip blank, method blank, laboratory control sample, and matrix spike/matrix spike duplicate. Data validation qualifiers and comments are provided on the data tables to indicate the results of the data validation and to quantitatively indicate the usability of the data. In addition, field sampling records are reviewed to assess the potential for any field conditions to adversely impact the data quality.

A holding time violation occurred for total sulfide in samples from wells 5-MW-15 and 15-MW-18. However this discrepancy is considered minor and does not significantly impact the data quality or interpretations presented in this report. The data quality objectives for the winter 2006 sampling at Site 5 Cluster were achieved.

6.0 RECOMMENDATIONS

Recommendations from the fall 2005 Groundwater Monitoring Report are presented below:

1. Pursuant to recommendations for sampling for emergent compounds under the BGMP from the Final Supplemental Basewide Preliminary Assessment for Identification of Emergent Compounds

of Concern Usage (Metcalf & Eddy 2005), Tetra Tech and the Air Force recommended adding analysis for 1,2,3-trichloropropane (TCP) for wells 5-MW-7 (sampled at the top and bottom of the screened interval), 5-MW-15, 5-MW-18, 5-MW-23, and 6-MW-1 beginning with spring 2006. The RWQCB and DTSC requested that the Air Force reevaluate the conceptual site model, identify data gaps, and recommend actions to fill those data gaps as well as considering concentrations of TCP in other site wells when preparing recommendations for further sampling of emergent chemicals (Comment 2). The Air Force concurred with the RWQCB and DTSC and provided a revised recommendation for sampling TCP at Site 5 Cluster in response to RWQCB and DTSC comments on the fall 2005 report, dated 26 May 2006. The Air Force has not received a response from the RWQCB and DTSC yet on the Air Force response to State Comment 2.

2. Tetra Tech and the Air Force recommended removing total dissolved solids analyses from the sampling program at Site 5 Cluster beginning with spring 2006. The RWQCB and DTSC concurred with this recommendation.
3. Tetra Tech and the Air Force recommended removing hexavalent chromium analysis for well 5-MW-18 from the sampling program at Site 5 Cluster beginning with spring 2006. The RWQCB and DTSC concurred with this recommendation.
4. Tetra Tech and the Air Force recommended reducing the hexavalent chromium sampling frequency from quarterly to annually during winter sampling events for wells 5-MW-7 (T and B) and 6-MW-3 beginning with spring 2006. The RWQCB and DTSC concurred with this recommendation.
5. Tetra Tech and the Air Force recommended reducing the dissolved metals analyte list at Site 5 Cluster to arsenic only. The RWQCB and DTSC did not concur with this recommendation since it was based exclusively on risk evaluations and the RWQCB tasked with protecting all beneficial uses of the sites' water. A post-RPM (remedial project managers) meeting was conducted on 7 June 2006 to discuss the most expeditious and defensible method of evaluating metals analysis for frequency reduction or removal for wells sampled under the BGMP. Post-RPM meeting minutes will be available by the end of June 2006.

The spring 2006 sampling will be conducted according to the Site 5 Cluster BGMP Work Plan Addendum (Tetra Tech 2002).

7.0 REFERENCES

Metcalf & Eddy

2005 *Supplemental Basewide Preliminary Assessment (PA) for Identification of Emergent Compounds of Concern Usage, Installation Restoration Program, Vandenberg Air Force Base, California.* Prepared for Department of the Air Force 30 CES/CEV, Installation Restoration Program, Vandenberg Air Force Base, California, Headquarters Air Force Space Command, Peterson Air Force Base, Colorado, and the Air Force Center for Environmental Excellence, 3300 Sidney Brooks, Brooks City-Base, Texas. December.

Tetra Tech, Inc.

2000a *Basewide Groundwater Monitoring Program Work Plan.* Prepared for 30 CES/CEV, Installation Restoration Program, Vandenberg Air Force Base, California, and Headquarters Air Force Space Command, Peterson Air Force Base, Colorado. December.

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2000b *Basewide Groundwater Monitoring Program Health and Safety Plan Addendum.* Prepared for 30 CES/CEV, Installation Restoration Program, Vandenberg Air Force Base, California, and Headquarters Air Force Space Command, Peterson Air Force Base, Colorado. December.

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2005b *Remedial Investigation Report, Site 5 Cluster – SLC 3E, SCL 3W, and Bear Creek Pond, Operable Unit 5 Remedial Investigation Feasibility Study, Vandenberg Air Force Base. Draft (electronic).* Prepared for Department of the Air Force 30 CES/CEVR, 806 13th Street, Suite 116, Vandenberg Air Force Base, California, and Department of the Air Force, Air Force Center for

Environmental Excellence, DERA Restoration Division, 3300 Sidney Brooks, Brooks City-Base, Texas. July.

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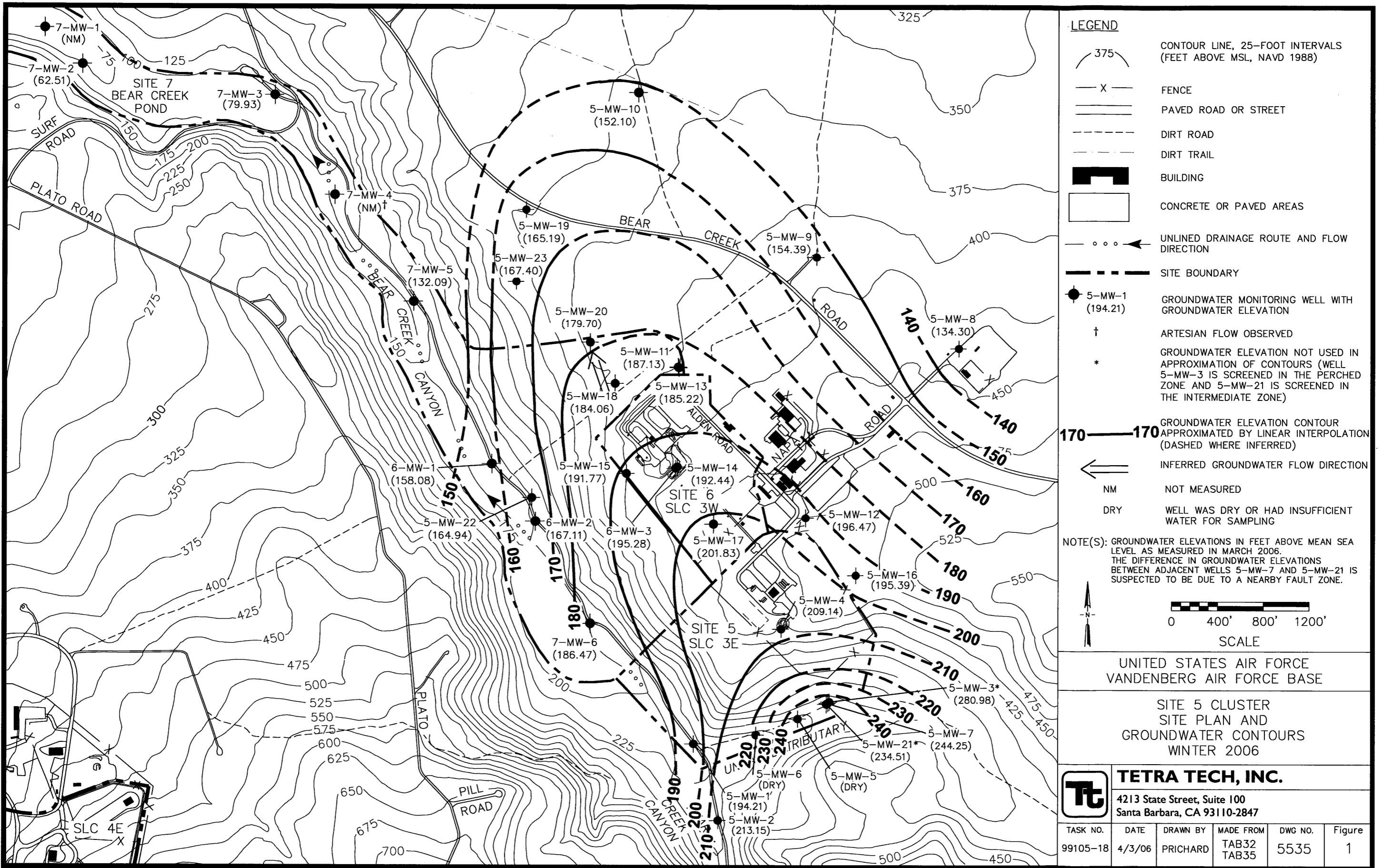
2005c *Basewide Groundwater Monitoring Program Report, Fall 2004, Installation Restoration Program Site 5 Cluster, Vandenberg Air Force Base, California*. Prepared for Department of the Air Force 30 CES/CEVR, 806 13th Street, Suite 116, Vandenberg Air Force Base, California, and Department of the Air Force, Air Force Center for Environmental Excellence, DERA Restoration Division, 3300 Sidney Brooks, Brooks City-Base, Texas. March.

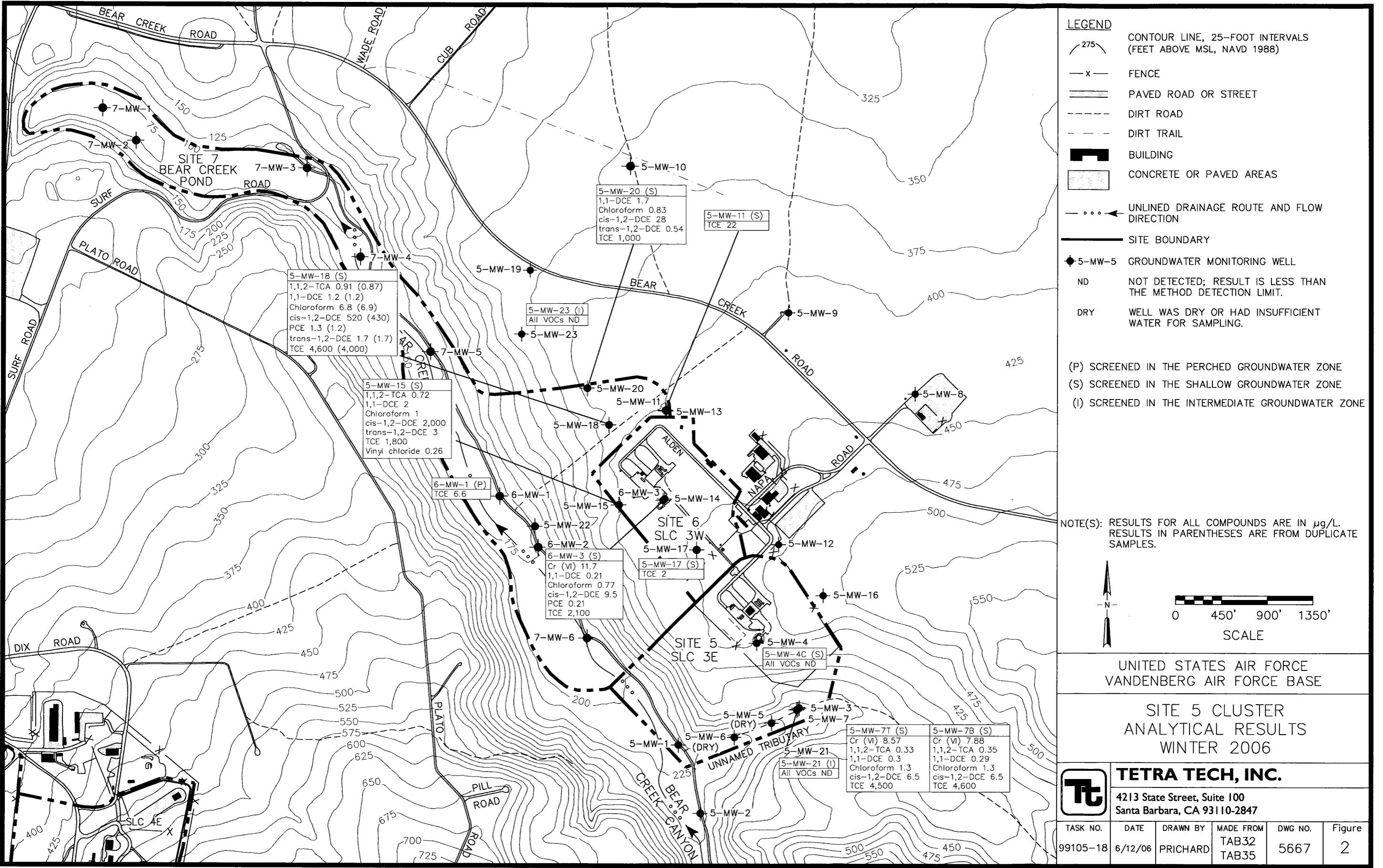
U.S. Air Force

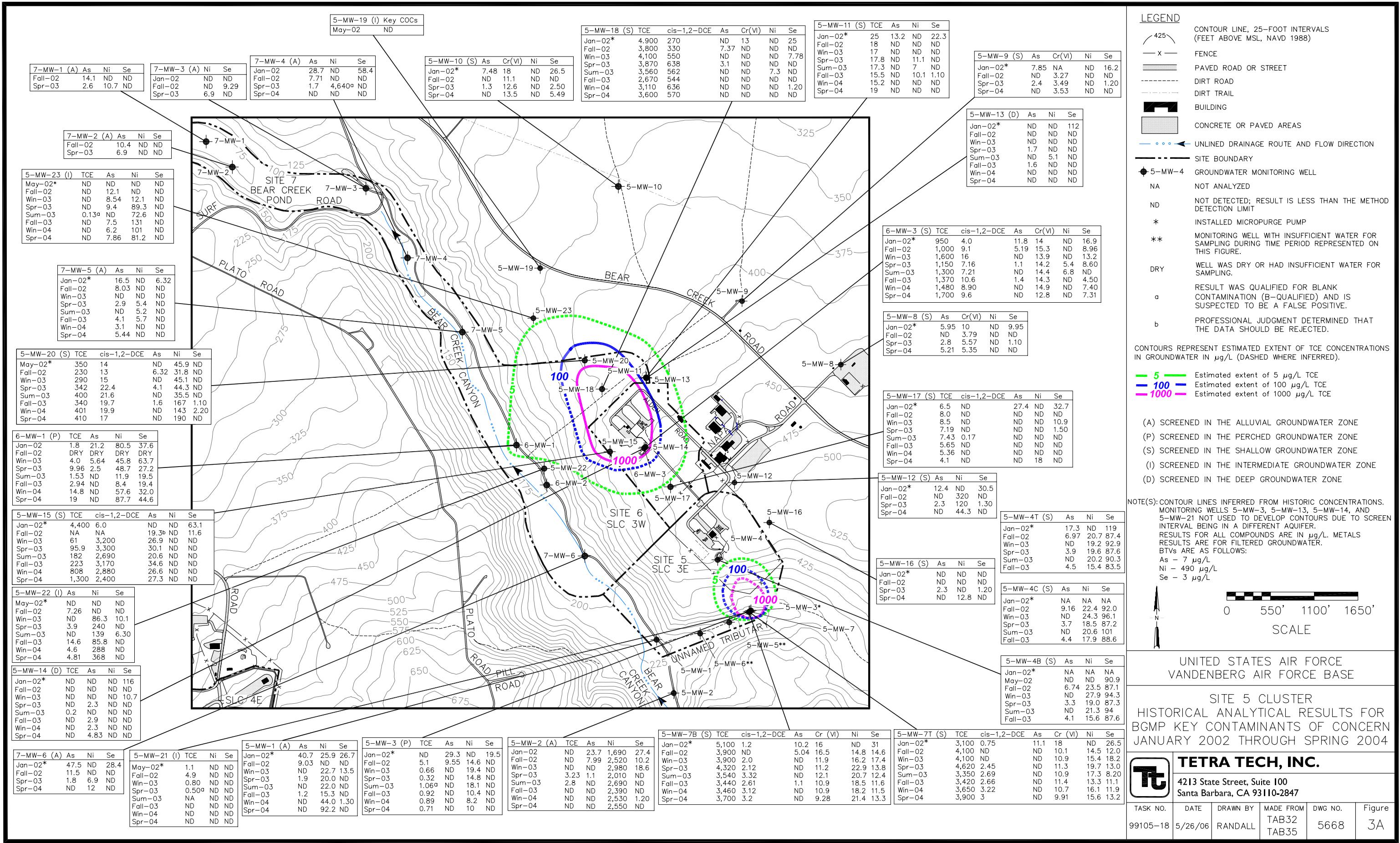
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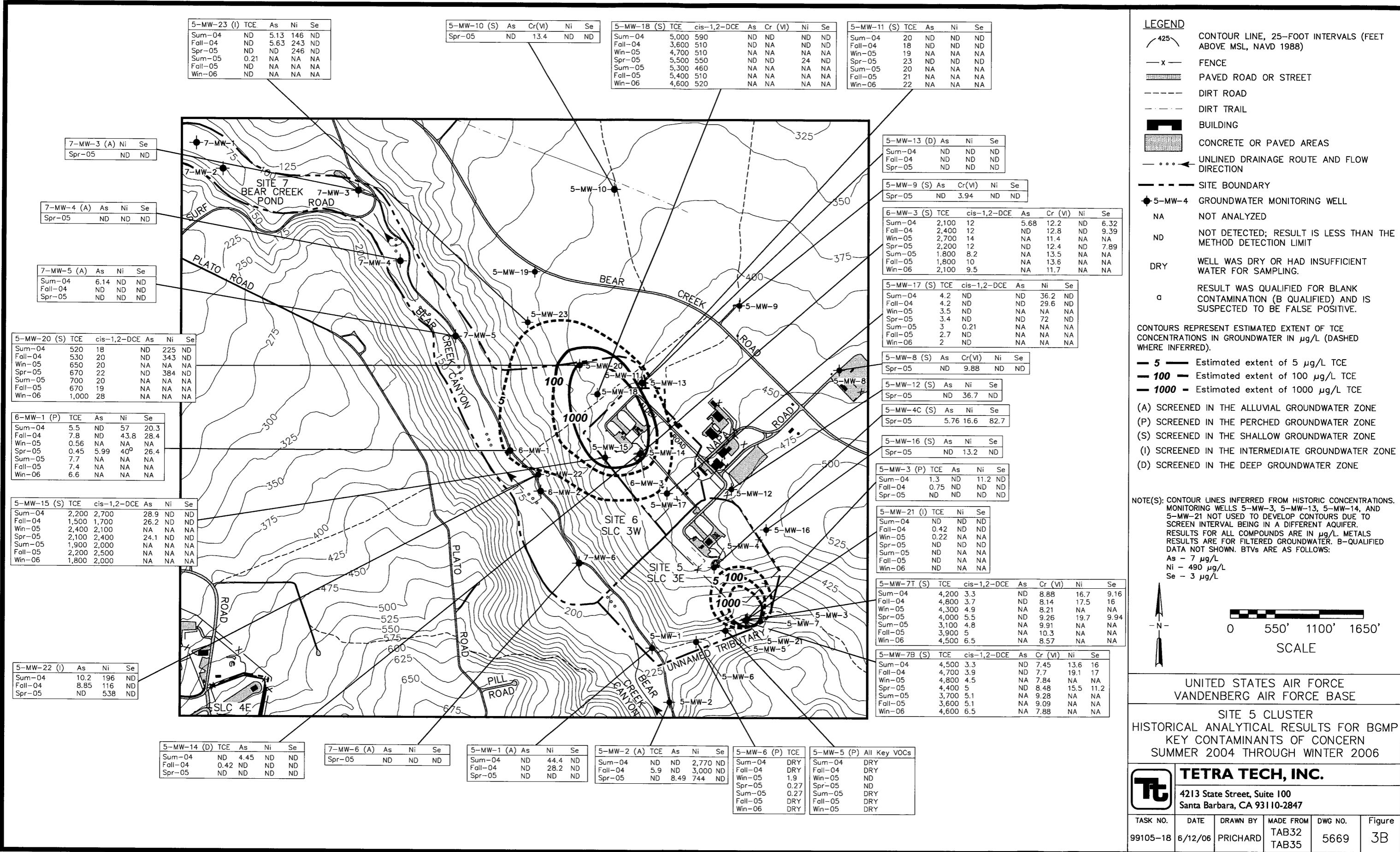
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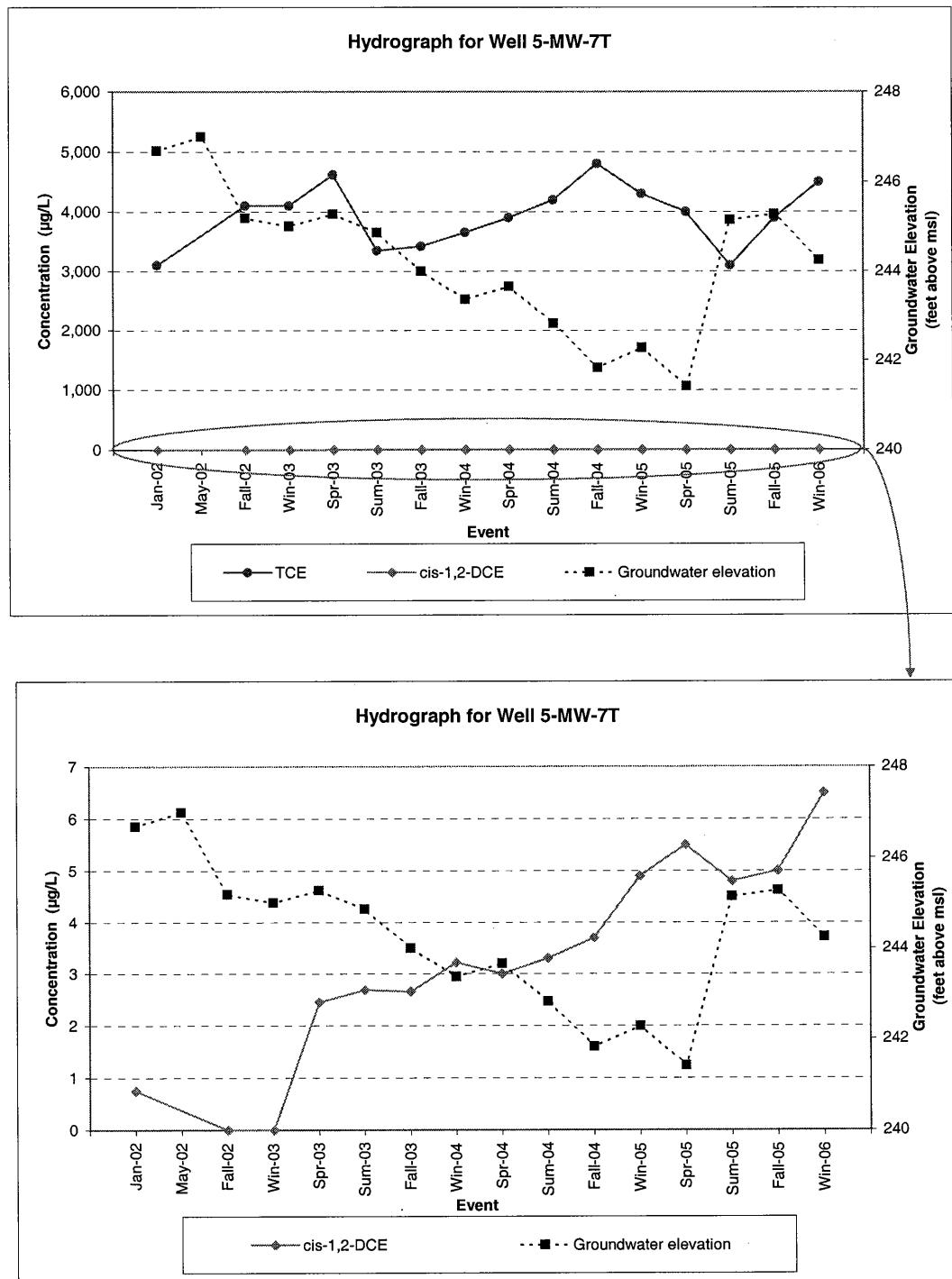


Figure 4. Groundwater Elevations and Concentrations of TCE and *cis*-1,2-DCE at Site 5 Cluster

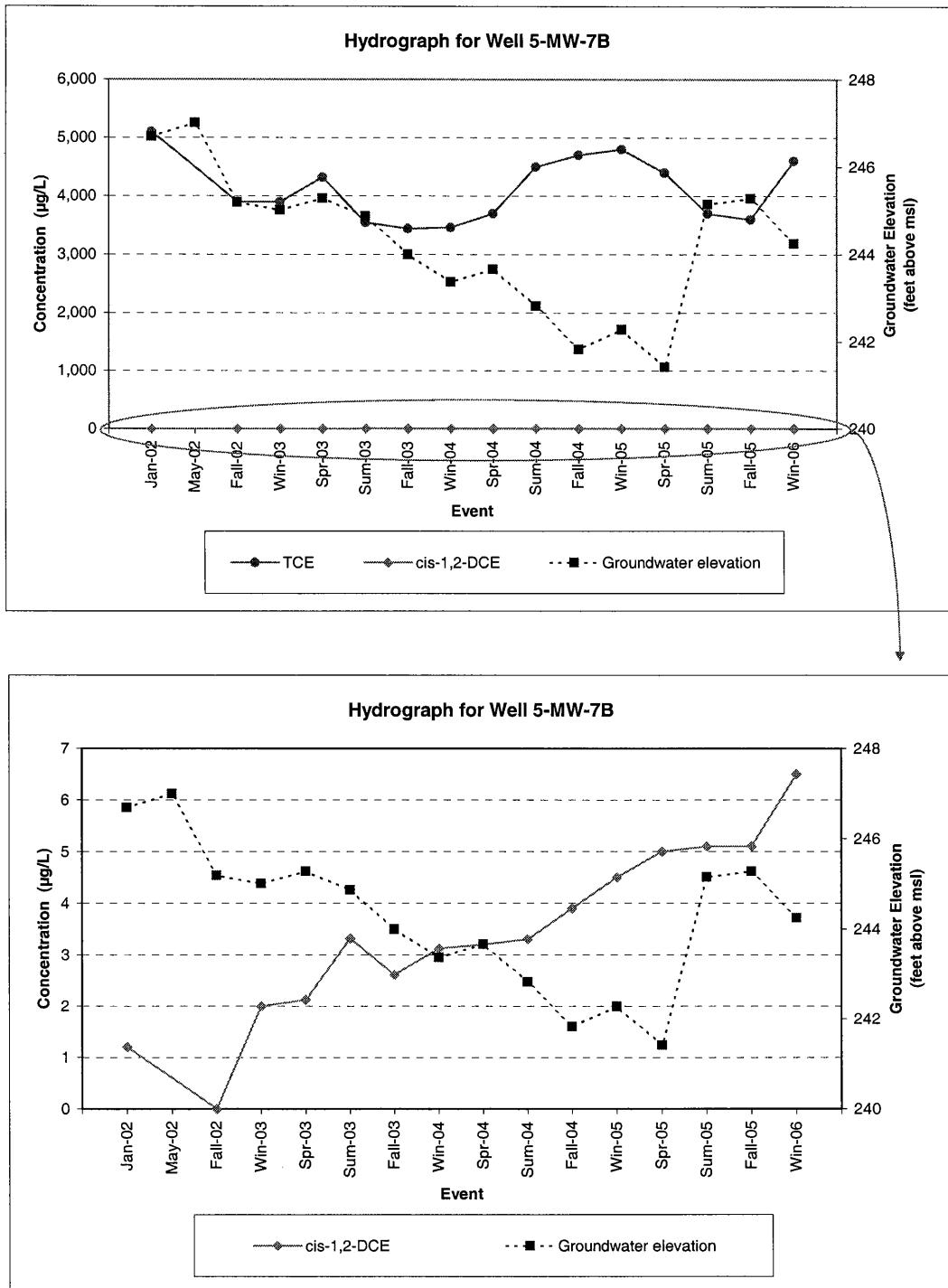


Figure 4 (cont.). Groundwater Elevations and Concentrations of TCE and *cis*-1,2-DCE at Site 5 Cluster

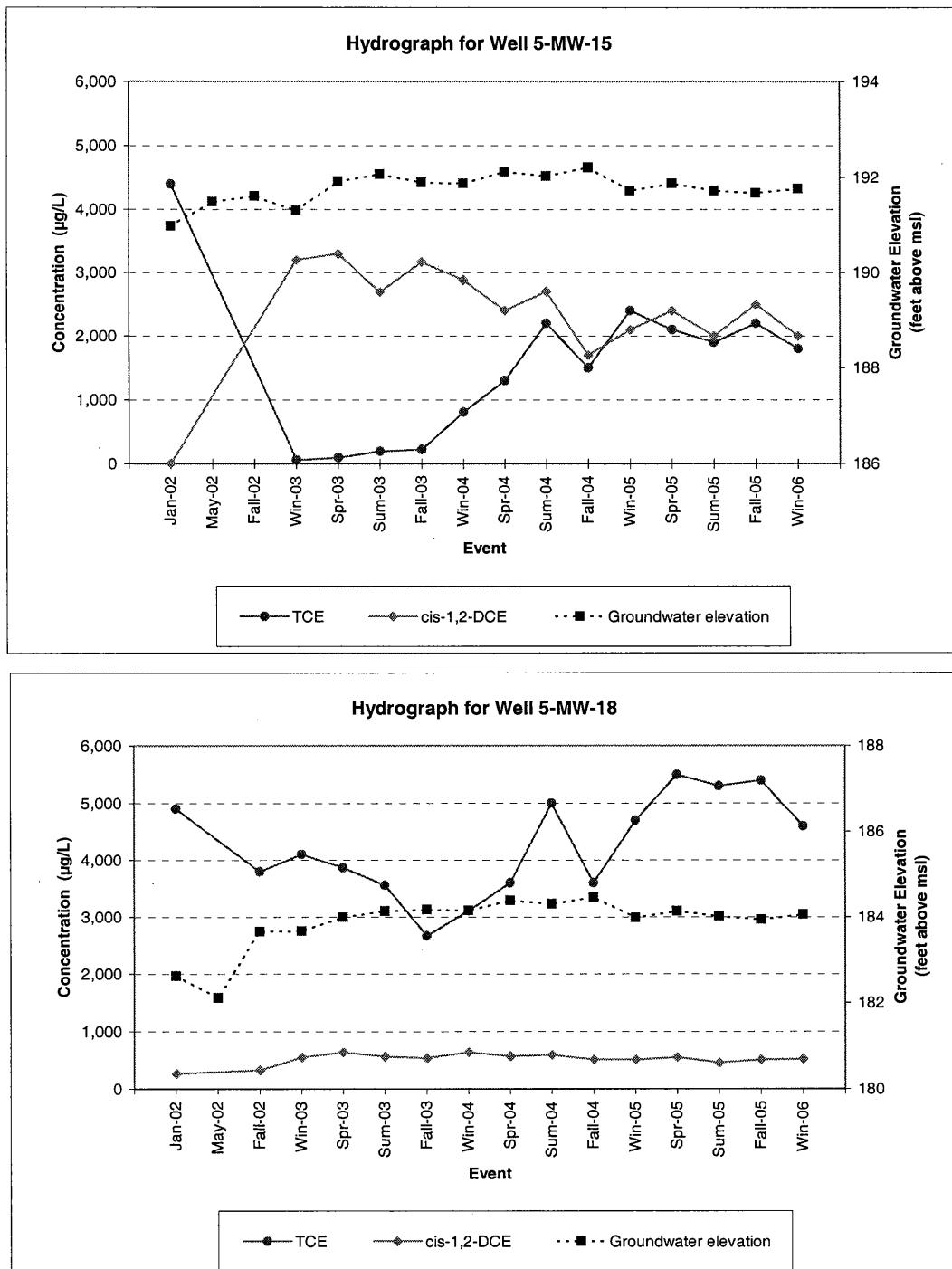


Figure 4 (cont.). Groundwater Elevations and Concentrations of TCE and *cis*-1,2-DCE at Site 5 Cluster

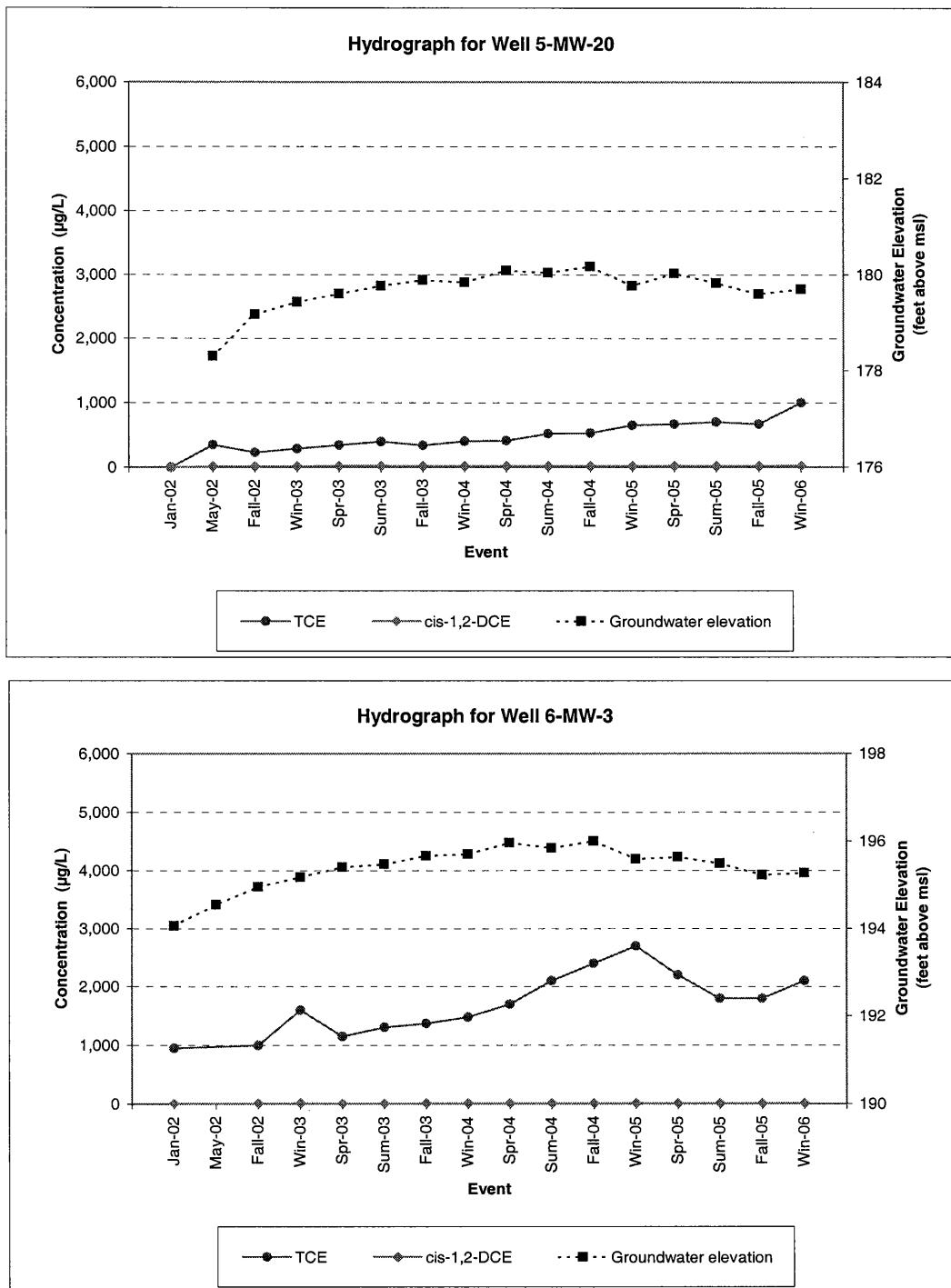


Figure 4 (cont.). Groundwater Elevations and Concentrations of TCE and *cis*-1,2-DCE at Site 5 Cluster

Table 1
Groundwater Elevations
IRP Site 5 Cluster (SLC 3E, SLC 3W, and Bear Creek Pond)
Vandenberg AFB, California

Monitoring Well	Top of Casing		Groundwater Depth (feet below TOC)	Groundwater Elevation (feet above msl)			
	Elevation (feet above msl)	Date Measured		Winter 2006	Fall 2005	Summer 2005	Spring 2005
5-MW-1	215.60	13-Mar-06	21.39	194.21	192.87	194.14	199.57
5-MW-2	245.48	13-Mar-06	32.33	213.15	213.12	213.34	215.23
5-MW-3	294.96	13-Mar-06	13.98	280.98	279.40	280.86	282.95
5-MW-4	443.52	13-Mar-06	234.38	209.14	208.95	208.92	208.69
5-MW-5	270.11	13-Mar-06	DRY	DRY	DRY	DRY	251.52
5-MW-6	245.84	13-Mar-06	DRY	DRY	DRY	225.26	230.76
5-MW-7	295.49	09-Mar-06	51.24	244.25	245.28	245.15	241.42
5-MW-8	443.35	13-Mar-06	309.05	134.30	134.17	134.12	134.00
5-MW-9	419.45	13-Mar-06	265.06	154.39	154.39	154.35	154.34
5-MW-10	359.82	13-Mar-06	207.72	152.10	152.07	152.09	152.02
5-MW-11	405.25	10-Mar-06	218.12	187.13	187.01	187.03	187.25
5-MW-12	473.42	13-Mar-06	276.95	196.47	196.33	196.41	196.33
5-MW-13	405.28	13-Mar-06	220.06	185.22	185.28	185.49	185.63
5-MW-14	416.93	13-Mar-06	224.49	192.44	192.31	192.54	192.67
5-MW-15	402.03	10-Mar-06	210.26	191.77	191.68	191.73	191.88
5-MW-16	509.24	13-Mar-06	313.85	195.39	195.00	194.87	194.64
5-MW-17	462.68	10-Mar-06	260.85	201.83	201.45	201.48	201.53
5-MW-18	387.89	10-Mar-06	203.83	184.06	183.94	184.02	184.14
5-MW-19	350.16	13-Mar-06	184.97	165.19	165.17	165.34	165.37
5-MW-20	384.32	09-Mar-06	204.62	179.70	179.60	179.83	180.03
5-MW-21	293.67	09-Mar-06	59.16	234.51	234.35	234.62	234.26
5-MW-22	174.69	13-Mar-06	9.75	164.94	164.72	164.73	165.32
5-MW-23	345.44	09-Mar-06	178.04	167.40	167.36	167.41	167.61
6-MW-1	165.71	13-Mar-06	7.63	158.08	157.95	157.92	158.10
6-MW-2	183.82	13-Mar-06	16.71	167.11	NM ¹	DRY	167.47
6-MW-3	416.90	09-Mar-06	221.62	195.28	195.23	195.50	195.64
7-MW-1	54.44	13-Mar-06	NM ²	NM ²	NM ²	NM ²	NM ²
7-MW-2	78.02	13-Mar-06	15.51	62.51	62.34	62.52	NM ²
7-MW-3	88.20	13-Mar-06	8.27	79.93	78.90	78.60	79.16
7-MW-4	102.80	13-Mar-06	NM ³	NM ³	NM ³	NM ³	NM ³
7-MW-5	150.05	13-Mar-06	17.96	132.09	132.03	132.12	132.28
7-MW-6	189.43	13-Mar-06	2.96	186.47	186.05	186.11	186.17

Definition(s):

msl - mean sea level
 NM - not measured
 TOC - top of well casing

Note(s):

- 1 - Roots were encountered in the well and no water level measurement was taken.
- 2 - Well is located in Bear Creek Pond and was submerged during sampling round.
- 3 - Artesian flow observed in well.

Table 2
Water Quality Parameters
Winter 2006
EPA Methods E300.0, E310.1, E353.3, E376.2, E415.1, and RSK175
IRP Site 5 Cluster (SLC 3E, SLC 3W, and Bear Creek Pond)
Vandenberg AFB, California

Sampling Location	6-MW-1 V6MW1 13-Mar-06 Perched	5-MW-4 V5MW4C 13-Mar-06 Shallow	5-MW-7 V5MW7T 09-Mar-06 Shallow	5-MW-7B V5MW7B 09-Mar-06 Shallow	5-MW-11 V5MW11 10-Mar-06 Shallow	5-MW-15 V5MW15 10-Mar-06 Shallow	5-MW-17 V5MW17 10-Mar-06 Shallow	5-MW-18 V5MW18 10-Mar-06 Shallow	5-MW-18 V5MW18 10-Mar-06 Shallow
Laboratory Parameters (mg/L)	MDL ²	PQL ²							
Chloride	0.10	0.2	NA	NA	NA	NA	119	g	186
Sulfate	0.09	1.0	NA	NA	NA	NA	61.3	g	63.2
Alkalinity, total (as CaCO ₃)	2.5	5.0	NA	NA	NA	NA	129	g	166
Nitrogen as nitrate + nitrite	0.02	0.1	NA	NA	NA	NA	0.514	g	0.986
Total sulfide	0.1	1.0	NA	NA	NA	NA	0.1	UJ e	0.1 UJ e
Total organic carbon	1.0	5.0	NA	NA	NA	NA	1.58	J q	0.795
Laboratory Parameters (µg/L)									
Ethane	0.8	2.0	NA	NA	NA	NA	0.6	U g	0.6
Ethene	0.9	2.0	NA	NA	NA	NA	0.6	U g	0.6
Methane	0.6	2.0	NA	NA	NA	NA	180	g	2.7
Field Parameters ¹ :									
Temperature (°Celsius)	N/A	N/A	14.55	17.53	16.28	16.01	16.83	15.14	17.55
Conductivity (µmhos/cm)	N/A	N/A	446	920	626	624	599	631	504
pH	N/A	N/A	6.51	5.76	5.91	5.91	6.59	6.97	7.33
Turbidity (NTUs)	N/A	N/A	48.6	4.86	5.13	3.92	0.04	1.20	4.63
Dissolved oxygen (mg/L)	N/A	N/A	3.50	7.46	0.53	1.06	7.87	0.81	1.35
Oxidation/reduction potential (mV)	N/A	N/A	130.6	169	218.8	246.0	-25.2	-84.9	-62.7
Fe II (mg/L)	N/A	N/A	NM	NM	NM	NM	NM	2.0	NM
									0.0

Sampling Location	5-MW-20 V5MW20 09-Mar-06	6-MW-3 V6MW3 09-Mar-06	5-MW-21 V5MW21M 09-Mar-06	5-MW-23 V5MW23 09-Mar-06
Groundwater Zone	Shallow	Shallow	Intermediate	Intermediate
Field Parameters¹:				
Temperature (°Celsius)	16.22	16.96	16.11	15.92
Conductivity (µmhos/cm)	956	439	906	846
pH	8.33	6.47	7.02	7.58
Turbidity (NTUs)	0.93	0.43	0.18	3.24

Site 5 Average Values (5-MW-15 and 5-MW-18):
Dissolved Oxygen 1.17 mg/L
Oxidation/Reduction Potential -70.1 mV
Fe II 0.67 mg/L
Methane 62 µg/L
Total Organic Carbon 1.05 mg/L
Nitrogen as nitrate + nitrite 0.77 mg/L

Table 2
Water Quality Parameters
EPA Methods E300.0, E310.1, E353.3, E376.2, E415.1, and RSK175
Winter 2006
IRP Site 5 Cluster (SLC 3E, SLC 3W, and Bear Creek Pond)
Vandenberg AFB, California

Data Validity Qualifier(s):	J	- The analyte was positively identified and the result is usable; however, the analyte concentration is an estimated value.
U	U	- The analyte was not detected at or above the MDL.
UJ	UJ	- The analyte was not detected above the MDL; however, the MDL is uncertain and may be elevated above normal levels.
Data Validity Comment(s):		
e	e	- A holding time violation occurred.
f	f	- The duplicate/replicate sample's relative percent difference was outside the control limit.
g	g	- The data met prescribed criteria as detailed in the QAPP.
q	q	- The analyte detection was below the PQL.
Definition(s):		
CaCO ₃	-	calcium carbonate
(D)	-	duplicate sample
Fe II	-	ferrous iron
MDL	-	method detection limit
µg/L	-	micrograms per liter
µmhos/cm	-	micromhos per centimeter
mg/L	-	milligrams per liter
mV	-	millivolts
N/A	-	not applicable
NA	-	not analyzed
NM	-	not measured
NTU	-	nephelometric turbidity unit
PQL	-	practical quantitation limit
QAPP	-	Quality Assurance Project Plan
Note(s):		
Fe II units of mg/L are equivalent to parts per million measured in the field.		
1		- All field parameters were measured immediately prior to sampling.
2		- Values from QAPP Addendum (Tetra Tech 2004).

Table 3
Hexavalent Chromium in Groundwater
Winter 2006
EPA Method E218.6 (µg/L)
IRP Site 5 Cluster (SLC 3E, SLC 3W, and Bear Creek Pond)
Vandenberg AFB, California

Sample Location	Sample ID	Collection Date	Groundwater Zone	Hexavalent Chromium
				MDL¹ 0.1
				PQL¹ 0.2
5-MW-7	V5MW7T	09-Mar-06	Shallow	8.57 g
5-MW-7	V5MW7B	09-Mar-06	Shallow	7.88 g
6-MW-3	V6MW3	09-Mar-06	Shallow	11.7 g

Data Validity Comment(s):

- g - The data met prescribed criteria as detailed in the QAPP.

Definition(s):

- B - bottom of screened interval
- MDL - method detection limit
- µg/L - micrograms per liter
- PQL - practical quantitation limit
- QAPP - Quality Assurance Project Plan
- T - top of screened interval

Note(s):

- 1 - Values from QAPP Addendum (Tetra Tech 2004).

Table 4
VOCs in Groundwater
Winter 2006
EPA Method SW8260B (µg/L)
IRP Site 5 (SLC 3E, SLC 3W, and Bear Creek Pond)
Vandenberg AFB, California

Sample Location	6-MW-1 V6MW1	5-MW-4 V5MW4C	5-MW-7T V5MW7T	5-MW-7B V5MW7B	5-MW-11 V5MW11	5-MW-15 V5MW15	5-MW-17 V5MW17
Sample ID	13-Mar-06	13-Mar-06	09-Mar-06	09-Mar-06	10-Mar-06	10-Mar-06	10-Mar-06
Collection Date							
Groundwater Zone	Perched	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
MDL ¹	PQL ¹	Primary MCL					
1,1,2-TCA	0.28	1.0	5	0.2 U g	0.33 J q	0.35 J q	0.2 U g
1,1-DCE	0.32	1.0	6	0.2 U g	0.3 J q	0.29 J q	0.2 U g
Chloroform	0.12	0.3	100 ²	0.2 U g	0.2 U g	1.3 g	0.2 U g
cis-1,2-DCE	0.21	1.0	6	0.2 U g	0.2 U g	6.5 g	0.2 U g
PCE	0.15	1.0	5	0.2 U g	0.2 U g	0.2 U g	0.2 U g
trans-1,2-DCE	0.27	1.0	10	0.2 U g	0.2 U g	0.2 U g	0.2 U g
TCE	0.18	1.0	5	6.6 J c	0.2 U g	4,500 J c	4,600 J c
Vinyl chloride	0.36	1.0	0.5	0.2 U g	0.2 U g	0.2 U g	0.2 U g
All other target analytes	N/A	N/A	ND	ND	ND	ND	ND
Sample Location	5-MW-18 V5MW18	5-MW-18 V99W635 (D)	5-MW-20 V5MW20	5-MW-20 V6MW20	6-MW-3 V6MW3	5-MW-21 V5MW21M	5-MW-23 V5MW23
Sample ID	10-Mar-06	10-Mar-06	09-Mar-06	09-Mar-06	09-Mar-06	09-Mar-06	09-Mar-06
Collection Date							
Groundwater Zone	Shallow	Shallow	Shallow	Shallow	Intermediate	Intermediate	Intermediate
MDL ¹	PQL ¹	Primary MCL					
1,1,2-TCA	0.28	1.0	5	0.91 J q	0.87 J q	0.2 U g	0.2 U g
1,1-DCE	0.32	1.0	6	1.2 g	1.2 g	1.7 g	0.21 J q
Chloroform	0.12	0.3	100 ²	6.8 g	6.9 g	0.83 g	0.77 g
cis-1,2-DCE	0.21	1.0	6	520 g	430 g	28 g	9.5 g
PCE	0.15	1.0	5	1.3 g	1.2 g	0.2 U g	0.2 U g
trans-1,2-DCE	0.27	1.0	10	1.7 g	1.7 g	0.54 J q	0.2 U g
TCE	0.18	1.0	5	4,600 J c	4,000 J c	1,000 J c	2,100 J c
Vinyl chloride	0.36	1.0	0.5	0.2 U g	0.2 U g	0.2 U g	0.2 U g
All other target analytes	N/A	N/A	ND	ND	ND	ND	ND

Table 4
VOCs in Groundwater
Winter 2006
EPA Method SW8260B (µg/L)
IRP Site 5 (SLC 3E, SLC 3W, and Bear Creek Pond)
Vandenberg AFB, California

Data Validity Qualifier(s):	
J	- The analyte was positively identified and the result is usable; however, the analyte concentration is an estimated value.
U	- The analyte was not detected at or above the MDL.
C	- The matrix spike and/or matrix spike duplicate recoveries were outside control limits.
G	- The data met prescribed criteria as detailed in the QAPP.
Q	- The analyte detection was below the PQL.
Definition(s):	
B	- bottom of screened interval
(D)	- duplicate sample
DCE	- dichloroethene
MCL	- maximum contaminant level
MDL	- method detection limit
µg/L	- micrograms per liter
N/A	- not applicable
ND	- not detected; result is less than the MDL
PCE	- tetrachloroethane
PQL	- practical quantitation limit
QAPP	- Quality Assurance Project Plan
T	- top of screened interval
TCA	- trichloroethane
TCE	- trichloroethene

Note(s):

Bold type indicates results that were above the MCL.

- 1 - Values from QAPP Addendum (Tetra Tech 2004).
- 2 - For total trihalomethanes (sum of bromoform, bromodichloromethane, chloroform, and dibromochloromethane).

Table 5
Summary of BGMP Key Contaminants of Concern ($\mu\text{g/L}$)
IRP Site 5 Cluster (SLC 3E, SLC 3W, and Bear Creek Pond)
Vandenberg AFB, California

Sample Location	Jan-02	May-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05	Fall-05	Win-06	TCE ^a	
																	ND	
Alluvial Zone																		
5-MW-1	ND	NA	ND	ND	ND	0.59 ^b	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
5-MW-2	ND	NA	ND	ND	3.23	2.8	ND	ND	ND	ND	5.9	NA	ND	ND	NA	ND	ND	NA
7-MW-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-3	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-4	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-5	ND	NA	ND	ND	0.55 ^b	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
7-MW-6	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perched Zone																		
5-MW-3	ND	NA	5.1	0.66	0.32	1.06 ^b	0.92	0.89	0.71	1.3	0.75	NA	ND	ND	ND	ND	ND	NA
5-MW-5	NA	NA	DRY	NA	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
5-MW-6	NA	NA	DRY	NA	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
6-MW-1	1.8	NA	DRY	4.0	9.96	1.53	2.94	14.8	19	5.5	7.8	0.56	0.45	7.7	7.4	6.6		
Shallow Zone																		
5-MW-4T	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	0.91	NA	NA	NA	NA	NA	NA	NA
5-MW-4C	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	ND	ND	ND	ND
5-MW-4B	NA	ND	ND	ND	0.12	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,100	NA	4,100	4,620	3,349	3,420	3,650	3,900	4,200	4,800	4,300	4,700	4,800	4,400	4,000	3,100	3,900	4,500	
5,100	NA	3,900	4,320	3,543	3,440	3,460	3,700	4,500	4,700	4,700	4,700	4,700	4,700	4,700	3,700	3,600	4,600	
5-MW-8	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
5-MW-9	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
5-MW-10	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-11	18	17	17.8	17	17.29	15.5	15.2	19	20	18	19	19	19	19	20	21	22	
5-MW-12	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
5-MW-13	4,400	NA	61	95.9	193.7	223	808	1,300	2,200	1,500	2,400	2,100	2,100	1,900	2,200	1,800		
5-MW-15	ND	NA	ND	NA	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	ND	NA	NA	
5-MW-16	6.5	NA	8.0	8.5	7.19	5.65	5.36	4.1	4.2	4.2	3.5	3.4	3.4	3	2.7	2		
5-MW-17	4,900	NA	3,800	4,100	3,870	3,557	2,670	3,110	3,600	5,000	3,600	4,700	5,500	5,300	5,400	4,600		
5-MW-18	350	230	290	342	400	340	401	410	520	530	650	670	700	670	700	670	1,000	
5-MW-20	950	NA	1,000	1,600	1,150	1,304	1,370	1,480	1,700	2,100	2,400	2,700	2,700	2,200	1,800	1,800	2,100	
Intermediate Zone																		
5-MW-21	NA	1.1	4.9	0.80	ND	0.5 ^b	ND	ND	ND	ND	0.42	0.22	ND	ND	ND	ND	ND	
5-MW-22	NA	ND	ND	ND	ND	0.31 ^b	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	
5-MW-23	NA	ND	ND	ND	0.13 ^b	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.21	ND	ND	
Deep Zone																		
5-MW-13	ND	NA	ND	ND	ND	0.12	ND	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA	
5-MW-14	ND	NA	ND	ND	0.2	ND	ND	ND	ND	ND	0.42	NA	ND	NA	NA	NA	NA	

Table 5
Summary of BGMP Key Contaminants of Concern ($\mu\text{g/L}$)
IRP Site 5 Cluster (SLC 3E, SLC 3W, and Bear Creek Pond)
Vandenberg AFB, California

Sample Location	Jan-02	May-02	Fall-02	Win-03	Spr-03	Sum-03	<i>cis</i> -1,2-DCE ^c			Spr-04	Sum-04	Fall-04	Win-05	Spr-05	Sum-05	Fall-05	Win-06	
							Fall-03	Win-04	<i>cis</i> -1,2-DCE ^c									
Alluvial Zone																		
5-MW-1	ND	NA	ND	ND	0.16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA
5-MW-2	ND	NA	ND	ND	0.14	ND	ND	ND	0.53	NA	NA	ND	NA	NA	NA	NA	NA	NA
7-MW-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-3	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-4	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-5	ND	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA
7-MW-6	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perched Zone																		
5-MW-3	ND	NA	ND	ND	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	ND	ND	NA	NA	NA
5-MW-5	NA	NA	NA	NA	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	ND	ND	DRY	DRY	DRY
5-MW-6	NA	NA	NA	NA	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	ND	ND	ND	ND	ND
6-MW-1	ND	NA	DRY	0.93	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Shallow Zone																		
5-MW-4T	ND	NA	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-4C	NA	NA	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	ND	ND	ND	ND
5-MW-4B	NA	ND	ND	ND	2.45	2.69	2.66	2.66	3.22	3	3.3	3.7	4.9	NA	NA	NA	NA	NA
5-MW-7T	0.75	NA	ND	ND	2.0	2.12	3.32	2.61	3.12	3.2	3.3	3.9	4.5	ND	ND	ND	ND	ND
5-MW-7B	1.2	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-8	ND	NA	ND	NA	ND	NA	NA	NA	NA	ND	NA	NA	NA	NA	ND	ND	NA	NA
5-MW-9	ND	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-10	ND	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-MW-11	ND	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-12	ND	NA	ND	NA	ND	NA	NA	NA	NA	ND	NA	NA	NA	NA	ND	ND	NA	NA
5-MW-15	6.0	NA	NA	NA	3,200	2,693	3,170	2,880	2,400	2,700	2,700	2,100	2,100	2,400	2,000	2,500	2,000	2,000
5-MW-16	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	NA	ND	NA	NA	NA
5-MW-17	ND	NA	ND	ND	0.17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-MW-18	ND	NA	ND	ND	550	638	561.9	544	636	570	590	510	510	550	460	510	520	520
5-MW-20	NA	14	13	15	22.4	21.64	19.7	19.9	17	18	20	20	22	20	19	28	28	28
6-MW-3	4.1	NA	9.1	16	7.16	7.21	10.6	9.02	9.6	12	12	14	12	14	8.2	10	9.5	9.5
Intermediate Zone																		
5-MW-21	NA	ND	ND	ND	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-MW-22	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-MW-23	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Deep Zone																		
5-MW-13	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA
5-MW-14	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA

Table 5
Summary of BGMP Key Contaminants of Concern ($\mu\text{g/L}$)
IRP Site 5 Cluster (SLC 3E, SLC 3W, and Bear Creek Pond)
Vandenberg AFB, California

Sample Location	Jan-02	May-02	Fall-02	Win-03	Spr-03	Sum-03	Fall-03	Hexavalent Chromium	Chromium	Spr-04	Sum-04	Fall-04	Win-05	Sum-05	Fall-05	Win-06
Alluvial Zone																
5-MW-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perched Zone																
5-MW-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-5	NA	NA	DRY	NA	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
5-MW-6	NA	NA	DRY	NA	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
6-MW-1	ND	NA	DRY	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Shallow Zone																
5-MW-4T	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-4C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-4B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-7T	18	NA	10.1	10.9	11.3	10.9	11.4	10.7	9.91	8.88	8.14	8.21	9.26	9.91	10.3	8.57
5-MW-7B	16	NA	16.5	10.9	11.2	12.1	10.9	10.9	9.28	7.45	7.7	7.84	8.48	9.28	9.09	7.88
5-MW-8	10	NA	3.79	NA	5.57	NA	NA	NA	5.35	NA	NA	NA	9.88	NA	NA	NA
5-MW-9	NA	NA	3.27	NA	3.49	NA	NA	NA	3.53	NA	NA	NA	3.94	NA	NA	NA
5-MW-10	18	NA	11.1	NA	12.6	NA	NA	NA	13.5	NA	NA	NA	NA	13.4	NA	NA
5-MW-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-15	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-16	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-17	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-18	13	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-MW-20	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6-MW-3	14	NA	15.3	13.9	14.2	14.4	14.3	14.9	12.8	12.2	12.8	11.4	12.4	13.5	13.6	11.7
Intermediate Zone																
5-MW-21	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-22	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-23	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Deep Zone																
5-MW-13	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-14	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5
Summary of BGMP Key Contaminants of Concern ($\mu\text{g/L}$)
IRP Site 5 Cluster (SLC 3E, SLC 3W, and Bear Creek Pond)
Vandenberg AFB, California

Sample Location	Jan-02	May-02	Fall-02	Win-03	Spr-03	Sum-03	Dissolved Arsenic ^d	Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05	Sum-05	Fall-05	Win-06
Alluvial Zone																
5-MW-1	40.7	NA	9.03	ND	1.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
5-MW-2	2.4	NA	1.99	ND	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
7-MW-1	NA	NA	14.1	NA	2.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-2	NA	NA	10.4	NA	6.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-3	ND	NA	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA	ND	ND	NA	NA
7-MW-4	28.7	NA	7.71	NA	1.7	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA
7-MW-5	16.5	NA	8.03	ND	2.9	ND	4.1	3.1	5.44	6.14	NA	NA	ND	NA	NA	NA
7-MW-6	47.5	NA	11.5	NA	1.8	NA	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Perched Zone																
5-MW-3	39.3	NA	9.55	ND	ND	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
5-MW-5	NA	NA	DRY	NA	DRY	NA	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
5-MW-6	NA	NA	DRY	NA	DRY	NA	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
6-MW-1	21.2	NA	DRY	5.64	2.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.99	NA
Shallow Zone																
5-MW-4T	17.3	NA	6.97	ND	3.9	ND	4.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-4C	NA	NA	9.16	ND	3.7	ND	4.4	NA	NA	NA	NA	NA	NA	NA	5.76	NA
5-MW-4B	NA	ND	6.74	ND	3.3	ND	4.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-7T	11.1	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
5-MW-7B	10.2	NA	5.04	ND	ND	ND	ND	1.1	ND	ND	ND	ND	ND	ND	NA	NA
5-MW-8	5.95	NA	ND	NA	2.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-9	5.35	NA	ND	NA	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-10	7.48	NA	ND	NA	1.3	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA
5-MW-11	13.2	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
5-MW-12	12.4	NA	ND	NA	2.3	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA
5-MW-15	ND	NA	19.3	26.9	30.1	20.6	34.6	26.6	27.3	28.9	26.2	24.1	NA	NA	NA	NA
5-MW-16	ND	NA	ND	NA	2.3	NA	NA	ND	NA	NA	NA	NA	ND	ND	NA	NA
5-MW-17	27.4	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
5-MW-18	ND	NA	7.37	ND	3.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
5-MW-20	NA	ND	6.32	ND	4.1	ND	1.6	ND	ND	ND	ND	ND	ND	ND	NA	NA
6-MW-3	11.8	NA	5.19	ND	1.1	ND	1.4	ND	ND	5.68	ND	ND	ND	ND	NA	NA
Intermediate Zone																
5-MW-21	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
5-MW-22	NA	ND	7.26	ND	3.9	ND	14.6	4.6	4.81	10.2	8.85	NA	ND	ND	NA	NA
5-MW-23	NA	ND	12.1	8.54	9.2	ND	7.5	6.2	7.86	5.13	5.63	NA	ND	ND	NA	NA
Deep Zone																
5-MW-13	ND	NA	ND	ND	1.7	ND	1.6	ND	ND	ND	ND	NA	ND	ND	NA	NA
5-MW-14	ND	NA	ND	ND	2.3	ND	2.9	2.3	4.83	4.45	ND	NA	ND	NA	NA	NA

Table 5
Summary of BGMP Key Contaminants of Concern ($\mu\text{g/L}$)
IRP Site 5 Cluster (SLC 3E, SLC 3W, and Bear Creek Pond)
Vandenberg AFB, California

Sample Location	Jan-02	May-02	Fall-02	Win-03	Spr-03	Sum-03	Dissolved Nickel ^c						Spr-05	Sum-05	Fall-05	Win-06	
							Fall-03	Win-04	Spr-04	Sum-04	Fall-04	Win-05					
Alluvial Zone																	
5-MW-1	25.9	NA	ND	22.7	20.0	22.0	15.3	44.0	92.2	44.4	28.2	NA	ND	NA	NA	NA	NA
5-MW-2	1,696	NA	2,520	2,986	2,010	2,390	2,530	2,550	2,770	3,000	NA	744	NA	NA	NA	NA	NA
7-MW-1	NA	NA	ND	NA	10.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-2	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-3	ND	NA	ND	NA	NA	6.9	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA	NA
7-MW-4	ND	NA	ND	NA	NA	5.8	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA
7-MW-5	ND	NA	ND	NA	5.4	5.2	5.7	ND	ND	ND	NA	ND	NA	NA	NA	NA	NA
7-MW-6	ND	NA	ND	NA	NA	6.9	NA	NA	12	NA	NA	ND	NA	NA	NA	NA	NA
Perched Zone																	
5-MW-3	ND	NA	14.6	19.4	14.8	18.1	10.4	8.2	10	11.2	ND	NA	ND	NA	NA	NA	NA
5-MW-5	NA	NA	DRY	NA	DRY	DRY	DRY	DRY	DRY	DRY	DRY	NA	ND	DRY	DRY	DRY	DRY
5-MW-6	NA	NA	DRY	NA	DRY	DRY	DRY	DRY	DRY	DRY	DRY	NA	ND	DRY	DRY	DRY	DRY
6-MW-1	80.5	NA	DRY	45.8	48.7	11.9	8.4	57.6	87.7	57	43.8	NA	40 ^b	NA	NA	NA	NA
Shallow Zone																	
5-MW-4T	NA	NA	20.7	19.2	19.6	20.2	15.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-4C	NA	NA	22.4	24.3	18.5	20.6	17.9	NA	NA	NA	NA	NA	NA	16.6	NA	NA	NA
5-MW-4B	NA	ND	23.5	27.9	19	21.3	15.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-7T	ND	NA	14.5	15.4	19.7	17.3	13.3	16.1	15.6	16.7	17.5	NA	19.7	NA	NA	NA	NA
5-MW-7B	ND	NA	14.8	16.2	22.9	20.7	18.5	18.2	21.4	13.6	19.1	NA	15.5	NA	NA	NA	NA
5-MW-8	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA
5-MW-9	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA
5-MW-10	ND	NA	ND	NA	ND	NA	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA
5-MW-11	ND	NA	ND	ND	11.1	7	10.1	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
5-MW-12	ND	NA	320	NA	120	NA	NA	NA	44.3	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-15	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-MW-16	ND	NA	ND	NA	ND	NA	NA	NA	12.8	NA	NA	NA	NA	13.2	NA	NA	NA
5-MW-17	ND	NA	ND	ND	ND	ND	ND	ND	18	36.2	29.6	NA	72	NA	NA	NA	NA
5-MW-18	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	24	NA	NA	NA
5-MW-20	NA	45.9	31.8	45.1	44.3	35.5	167	143	190	225	343	NA	384	NA	NA	NA	NA
6-MW-3	ND	NA	ND	ND	5.4	6.8	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA
Intermediate Zone																	
5-MW-21	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA
5-MW-22	NA	ND	86.3	240	139	85.8	288	368	196	116	NA	538	NA	NA	NA	NA	NA
5-MW-23	NA	ND	ND	12.1	89.3	72.6	131	101	81.2	146	243	NA	246	NA	NA	NA	NA
Deep Zone																	
5-MW-13	ND	NA	ND	ND	ND	ND	5.1	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA
5-MW-14	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA

Table 5
Summary of BGMP Key Contaminants of Concern ($\mu\text{g/L}$)
IRP Site 5 Cluster (SLC 3E, SLC 3W, and Bear Creek Pond)
Vandenberg AFB, California

Sample Location	Jan-02	May-02	Fall-02	Win-03	Spr-03	Sum-03	Dissolved Selenium ^f					Spr-05	Sum-05	Spr-05	Sum-05	Fall-05	Win-06	
							Fall-03	Win-04	Spr-04	Sum-04	Fall-04							
Alluvial Zone																		
5-MW-1	26.7	NA	ND	13.3	ND	ND	1.30	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
5-MW-2	27.4	NA	0.2	18.6	ND	ND	1.20	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA
7-MW-1	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-2	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-3	ND	NA	9.29	NA	ND	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA	NA	NA
7-MW-4	58.4	NA	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-MW-5	63.2	NA	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
7-MW-6	28.4	NA	ND	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perched Zone																		
5-MW-3	9.5	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA
5-MW-5	NA	NA	DRY	NA	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
5-MW-6	NA	NA	DRY	NA	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
6-MW-1	7.6	NA	DRY	63.7	27.2	19.5	19.4	32.0	44.6	20.3	28.4	NA	26.4	NA	NA	NA	NA	NA
Shallow Zone																		
5-MW-4T	NA	NA	87.4	92.9	87.6	90.3	83.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-4C	NA	NA	92.0	96.1	87.2	101	88.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-4B	90.9	NA	87.1	94.3	87.3	94.0	87.6	NA	NA	NA	NA	NA	NA	NA	NA	82.7	NA	NA
5-MW-7T	26.5	NA	12.0	18.2	13.0	8.20	11.1	11.9	13.2	9.16	16	NA	NA	NA	9.94	NA	NA	NA
5-MW-7B	3	NA	14.6	17.4	13.8	12.4	11.6	11.5	13.3	16	17	NA	NA	NA	11.2	NA	NA	NA
5-MW-8	9.5	NA	ND	NA	1.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
5-MW-9	16.2	NA	ND	NA	1.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-MW-10	26.5	NA	ND	NA	2.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
5-MW-11	22.3	NA	ND	ND	ND	ND	1.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
5-MW-12	50.5	NA	ND	NA	1.30	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
5-MW-15	63.1	NA	11.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
5-MW-16	ND	NA	ND	NA	1.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
5-MW-17	32.7	NA	ND	10.9	1.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
5-MW-18	25	NA	ND	7.78	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
5-MW-20	NA	ND	ND	ND	1.10	2.20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
6-MW-3	16.9	NA	8.96	13.2	8.60	ND	4.50	7.40	7.31	6.32	9.39	NA	7.89	NA	NA	NA	NA	NA
Intermediate Zone																		
5-MW-21	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA
5-MW-22	NA	ND	ND	10.1	ND	6.30	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA
5-MW-23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA
Deep Zone																		
5-MW-13	1.2	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA
5-MW-14	1.6	NA	ND	10.7	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	NA	NA	NA	NA

Table 5
Summary of BGMP Key Contaminants of Concern ($\mu\text{g/L}$)
IRP Site 5 Cluster (SLC 3E, SLC 3W, and Bear Creek Pond)
Vandenberg AFB, California

Definition(s):	
BTV	- background threshold value
DCE	- dichloroethene
DRY	- Well was dry or had insufficient water for sampling.
MCL	- maximum contaminant level
$\mu\text{g/L}$	- micrograms per liter
NA	- not analyzed
ND	- Not detected; result is less than the method detection limit.
TCE	- trichloroethene

Note(s):	Bold type indicates results that were above the MCL. Shading indicates results that were above the 95th percentile BTV.
a	The MCL for TCE is 5 $\mu\text{g/L}$.
b	The data were qualified for blank contamination during the validation process. The laboratory method blank showed the same order of magnitude as the sample results. The sample results are strongly suspected to be false positive.
c	The MCL for <i>cis</i> -1,2-DCE is 6 $\mu\text{g/L}$.
d	The BTV and MCL for arsenic are 7 and 10 $\mu\text{g/L}$, respectively.
e	The BTV and MCL for nickel are 490 and 100 $\mu\text{g/L}$, respectively.
f	The BTV and MCL for selenium are 3 and 50 $\mu\text{g/L}$, respectively.

APPENDIX A

PURGE RECORDS



TETRA TECH, INC.
4213 State Street, STE 100
Santa Barbara, CA 93110
Telephone (805) 681-3100
Telefax (805) 681-3108

GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

Page 1 of 1

DATE	<u>3/13/06</u>	SITE NUMBER	<u>SC</u>
PROGRAM NAME	<u>Bamp</u>	TRIP BLANK I.D.	<u>V5T8118</u>
MONITORING WELL IDENTIFICATION	<u>5-MW-4(6)</u>	DUPLICATE I.D./ COLLECTION TIME	<u>-/-</u>
SAMPLE I.D.	<u>V5T8118</u>	TOTAL WELL DEPTH (ft btoc)	<u>271.1</u>
STATIC WATER LEVEL (ft btoc)	<u>334.18</u>	TUBING DIAMETER (in)	<u>.38</u>
WATER COLUMN (feet)	<u>36.7</u>	PUMP & TUBING (V) (L)	<u>2.86</u>
		5 V (L)	<u>14.3</u>

Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump Tubing Volumes Purged	Flow Rate (LPM)
1010	Arrived at well											
1028	Begin Purge											
1033		<u>334.97</u>	<u>17.46</u>	<u>617</u>	<u>5.84</u>	<u>620</u>	<u>7.22</u>	<u>180</u>	<u>Cloudy</u>	<u>1.80</u>	<u>0.63</u>	
1039		<u>335.16</u>	<u>17.56</u>	<u>918</u>	<u>5.78</u>	<u>611</u>	<u>7.10</u>	<u>178</u>	<u>Cloudy</u>	<u>3.60</u>	<u>1.26</u>	
1043		<u>335.34</u>	<u>17.51</u>	<u>919</u>	<u>5.78</u>	<u>955</u>	<u>7.15</u>	<u>174</u>	<u>Cloudy</u>	<u>5.40</u>	<u>1.86</u>	
1049		<u>335.40</u>	<u>17.55</u>	<u>910</u>	<u>5.77</u>	<u>6.53</u>	<u>7.62</u>	<u>172</u>	<u>Cloudy</u>	<u>7.10</u>	<u>2.52</u>	
1053		<u>335.50</u>	<u>17.53</u>	<u>910</u>	<u>5.76</u>	<u>9.86</u>	<u>7.46</u>	<u>169</u>	<u>Cloudy</u>	<u>9.00</u>	<u>3.15</u>	
1054	<u>End Purge</u>											
1055	<u>Sample</u>											
1060	Vacated well											

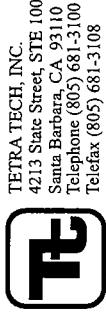
Fe+2 (ppm) — Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 235.50 FILTER LOT # —

Comments:

PARAMETERS FOR WATER QUALITY STABILIZATION			
Temperature ± 1 C (1.8 F)	Conductivity $\pm 5\%$	pH ± 0.1	Turbidity 5 NTUS

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.



GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

Page 1 of 1

DATE 3/13/06 SITE NUMBER 56 PURGING DEVICE _____ 2" SUBMERSIBLE GRUNDfos PUMP
 PROGRAM NAME Blimp TRIP BLANK I.D. V5T8R18 SAMPLING DEVICE _____ DISPOSABLE TEFLON BAILER
 MONITORING WELL IDENTIFICATION S-MW5 PID READING IN CASINC (ppm) (initial) 0.0 (vented to) 0.0
 SAMPLE I.D. - DUPLICATE I.D. / COLLECTION TIME - 1 - PID READING IN BREATHING ZONE (ppm) (initial) 0.0 (vented to) 0.0
 STATIC WATER LEVEL (ft btoc) 34' TOTAL WELL DEPTH (ft btoc) 33 SAMPLER'S SIGNATURE Melissa
 WATER COLUMN (feet) 0.2 Casing Diameter (in) 4 BAILER BOX # -
 WELL VOLUME (V) (gals) 0.13 3 V (gals) 0.39 BAILER BOX # -

Time	Activity	Water Level (ft btoc)	Pump Depth (ft btoc)	Temp (Deg. C)	EC (umhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (gals)	Well Volumes Purged	Flow Rate (GPM)
11:00	Arrived at well	—	—	—	—	—	—	—	—	—	—	—	—
11:15	Begin Purge	—	—	—	—	—	—	—	—	—	—	—	—
11:25	Well dry; no sample collected.	—	—	—	—	—	—	—	—	—	—	—	—
11:30	Vacated well	—	—	—	—	—	—	—	—	—	—	—	—

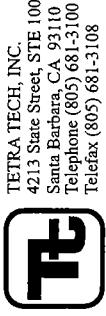
Fe+2 (ppm) - Taken from first bailer immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: -

Comments:

PARAMETERS FOR WATER QUALITY STABILIZATION			
Temperature	± 1 C (1.8 F)	Conductivity	$\pm 5\%$
pH	± 0.1	Turbidity	5 NTUs

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone will be periodically monitored during purging and sampling activities.



TETRA TECH, INC.
4213 State Street, STE 100
Santa Barbara, CA 93110
Telephone (805) 681-3100
Telefax (805) 681-3108

GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

DATE	3/13/06	SITE NUMBER	SL	PURGING DEVICE		2" SUBMERSIBLE GROUNDFLOW PUMP							
PROGRAM NAME	BWMI	TRIP BLANK I.D.	VST0108	SAMPLING DEVICE		DISPOSABLE TEFLON BAILER							
MONITORING WELL IDENTIFICATION	S-MW-6	DUPPLICATE I.D. / COLLECTION TIME	-1-	PID READING IN CASINC (ppm)	(initial) 0.0	(vented to) 0.0							
SAMPLE I.D.		STATIC WATER LEVEL (ft btoc)	48.5	PID READING IN BREATHING ZONE (ppm)	(initial) 0.0	(vented to) 0.0							
WATER COLUMN (feet)	0.1	TOTAL WELL DEPTH (ft btoc)	26.5	SAMPLER'S SIGNATURE <i>Meh. M. H.</i> <i>Jill C. D.</i>									
WELL VOLUME (V) (gals)	0.13	CASING DIAMETER (in)	0.39	BAILER BOX #	-								
Time	Activity	Water Level (ft btoc)	Pump Depth (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (gals)	Well Volumes Purged	Flow Rate (GPM)
1232	Arrived at well	—	—	—	—	—	—	—	—	—	—	—	—
—	Begin Purge	—	—	—	—	—	—	—	—	—	—	—	—
1235	Well dry; no sample collected.	—	—	—	—	—	—	—	—	—	—	—	—
1236	Vacated well	—	—	—	—	—	—	—	—	—	—	—	—

Fe+2 (ppm) Taken from first bailer immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: FILTER LOT # _____

Comments: _____

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PARAMETERS FOR WATER QUALITY STABILIZATION		
Temperature	+1 °C (18 F)	Conductivity ± 5%
pH	± 0.1	Turbidity 5 NTUs

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.



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GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

DATE 3-9-06 SITE NUMBER 5C

PROGRAM NAME B6MP TRIP BLANK ID. V5TB1213

MONITORING WELL IDENTIFICATION 5-MW-7(T)

SAMPLE I.D. Y5MW7T DUPLICATE I.D. / COLLECTION TIME 54.17

STATIC WATER LEVEL (ft btoc) 54.17 TOTAL WELL DEPTH (ft btoc) 82.7

WATER COLUMN (feet) 28.51 TUBING DIAMETER (in) 3/8"

PUMP & TUBING (V) (L) 1.15 TUBING LENGTH (L) 5.75

Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump Tubing Volumes Purged	Flow Rate (LPM)
1221	Arrived at well	—	—	—	—	—	—	—	—	—	—	—
1225	Begin Purge	—	—	—	—	—	—	—	—	—	—	0.15
1230	53.90	15.96	6.26	5.91	2.95	0.93	230.2	clear	0.75	0.65	—	—
1235	53.98	15.68	6.18	5.91	4.22	0.79	228.7	clear	1.50	1.30	—	—
1240	54.02	15.69	6.16	5.91	5.85	0.74	229.6	clear	2.25	1.95	—	—
1245	54.04	16.57	6.28	5.90	10.1	0.65	226.0	clear	3.00	2.60	—	—
1250	54.10	17.17	6.39	5.93	8.55	0.75	222.5	clear	3.75	3.25	—	—
1255	54.14	17.08	6.38	5.93	7.31	0.63	219.9	clear	4.50	3.90	—	—
1300	54.18	16.35	6.28	5.93	6.56	0.57	217.0	clear	5.25	4.55	—	—
1305	54.25	6.28	6.26	5.91	5.13	0.53	218.8	clear	6.00	5.20	—	—
1306	End Purge	—	—	—	—	—	—	—	—	—	—	—
1310	Sample	—	—	—	—	—	—	—	—	—	—	—
1315	Vacated well	—	—	—	—	—	—	—	—	—	—	—

Fr+2 (ppm) — Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 54.25 FILTER LOT #: —

Comments: _____

PARAMETERS FOR WATER QUALITY STABILIZATION			
Temperature	± 1 C (1.8 F)	Conductivity	$\pm 5\%$
pH	± 0.1	Turbidity	5 NTUs

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.



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GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

Page 1 of 1

DATE <u>3-9-06</u>		SITE NUMBER <u>5C</u>		PURGING DEVICE		MICROPURGE DEDICATED PUMP						
PROGRAM NAME <u>B6mp</u>	TRIP BLANK I.D. <u>VST B1213</u>	SAMPLING DEVICE		PURGING DEVICE		MICROPURGE DEDICATED PUMP						
MONITORING WELL IDENTIFICATION	<u>5-MW-7(B)</u>	PID READING IN CASING (ppm)	(initial) <u>0.0</u>	(vented to)	<u>0.0</u>							
SAMPLE I.D. <u>V5MWTB</u>	DUPLICATE I.D. / COLLECTION TIME <u>51.24</u> — / —	PID READING IN BREATHING ZONE (ppm)	(initial) <u>0.0</u>	(vented to)	<u>0.0</u>							
STATIC WATER LEVEL (ft bloc)	<u>51.24</u>	TOTAL WELL DEPTH (ft bloc)	<u>82.7</u>									
WATER COLUMN (feet)	<u>31.5</u>	TUBING DIAMETER (in)	<u>3/8</u>	SAMPLER'S SIGNATURE	<u>Dee S. J.</u>							
PUMP & TUBING (V) (L)	<u>1.15</u>	5 V (L)	<u>5.75</u>									
Time	Activity	Water Level (ft bloc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump & Tubing Volumes Purged	Flow Rate (LPM)
1150	Arrived at well	—	—	—	—	—	—	—	—	—	—	—
1200	Begin Purge	—	—	—	—	—	—	—	—	—	—	0.21
1204	<u>53.80</u>	<u>16.27</u>	<u>6.28</u>	<u>3.93</u>	<u>7.11</u>	<u>1.74</u>	<u>269.6</u>	<u>clear</u>	<u>0.84</u>	<u>0.73</u>		
1208	<u>53.79</u>	<u>15.97</u>	<u>6.24</u>	<u>5.92</u>	<u>4.10</u>	<u>1.26</u>	<u>253.7</u>	<u>clear</u>	<u>1.68</u>	<u>1.46</u>		
1212	<u>53.93</u>	<u>16.01</u>	<u>6.24</u>	<u>5.91</u>	<u>3.92</u>	<u>1.06</u>	<u>246.0</u>	<u>clear</u>	<u>2.52</u>	<u>2.19</u>		
1213	<u>End Purge</u>											
1215	<u>Sample</u>											
1220	<u>Vacated well</u>											

Fe+2 (ppm) — Taken immediately before sampling.

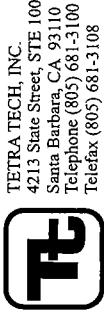
WATER LEVEL (ft bloc) AT TIME OF SAMPLING: 53.93 FILTER LOT # —

Comments: _____

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PARAMETERS FOR WATER QUALITY STABILIZATION			
Temperature ± 1 C (1.8 F)	<u>—</u>	Conductivity $\pm 5\%$	<u>—</u>
pH ± 0.1	<u>—</u>	Turbidity 5 NTU	<u>—</u>

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.



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GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

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5C

DATE	<u>3-10-06</u>	SITE NUMBER	<u>5C</u>
PROGRAM NAME	<u>BGMP</u>	TRIP BLANK I.D.	<u>V5TB1216</u>
MONITORING WELL IDENTIFICATION	<u>5-MW-11</u>	DUPPLICATE I.D. / COLLECTION TIME	<u>— / —</u>
SAMPLE I.D.	<u>V5MW11</u>	TOTAL WELL DEPTH (ft btoc)	<u>238.7</u>
STATIC WATER LEVEL (ft btoc)	<u>218.12</u>	TUBING DIAMETER (in)	<u>3/8"</u>
WATER COLUMN (feet)	<u>20.6</u>	5 V (L)	<u>13.2</u>
PUMP & TUBING (V) (L)	<u>2.64</u>		

Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump Tubing Volumes Purged	Flow Rate (L/PM)
<u>1310</u>	Arrived at well											
<u>1322</u>	Begin Purge											
<u>1327</u>	<u>218.28</u>	<u>16.39</u>	<u>601</u>	<u>7.10</u>	<u>0.53</u>	<u>8.84</u>	<u>-34.4</u>	<u>clear</u>	<u>1.20</u>	<u>0.45</u>	<u>—</u>	<u>0.24</u>
<u>1332</u>	<u>218.28</u>	<u>16.60</u>	<u>598</u>	<u>6.91</u>	<u>0.46</u>	<u>7.86</u>	<u>-30.6</u>	<u>clear</u>	<u>2.40</u>	<u>0.90</u>	<u>—</u>	<u>—</u>
<u>1337</u>	<u>218.30</u>	<u>16.85</u>	<u>598</u>	<u>6.75</u>	<u>0.48</u>	<u>8.03</u>	<u>-30.9</u>	<u>clear</u>	<u>3.60</u>	<u>1.35</u>	<u>—</u>	<u>—</u>
<u>1342</u>	<u>218.28</u>	<u>16.93</u>	<u>577</u>	<u>6.65</u>	<u>0.34</u>	<u>7.84</u>	<u>-28.6</u>	<u>clear</u>	<u>4.80</u>	<u>1.80</u>	<u>—</u>	<u>—</u>
<u>1347</u>	<u>218.28</u>	<u>16.78</u>	<u>597</u>	<u>6.61</u>	<u>0.36</u>	<u>7.83</u>	<u>-29.0</u>	<u>clear</u>	<u>6.00</u>	<u>2.25</u>	<u>—</u>	<u>—</u>
<u>1352</u>	<u>218.28</u>	<u>16.83</u>	<u>599</u>	<u>6.57</u>	<u>0.04</u>	<u>7.87</u>	<u>-25.2</u>	<u>clear</u>	<u>7.20</u>	<u>2.70</u>	<u>—</u>	<u>—</u>
<u>1353</u>	<u>End Purge</u>											
<u>1355</u>	<u>Sample</u>											
<u>1405</u>	Vacated well											

Fe+2 (ppm) — Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 218.28 FILTER LOT #: —

Comments:

PARAMETERS FOR WATER QUALITY STABILIZATION		
Temperature ± 1 C (1.8 F)	Conductivity $\pm 5\%$	pH ± 0.1

Turbidity 5 NTUs

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.



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GROUNDWATER MONITORING WELL FIELD DATA LOG SHEET - PURGING

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DATE 3-10-06

SITE NUMBER 5C

PROGRAM NAME BGMF
TRIP BLANK ID. V5TB1216

PURGING DEVICE _____
MICROPURGE DEDICATED PUMP

MONITORING WELL IDENTIFICATION 5-MW-15
SAMPLE I.D. V5MW15 DUPLICATE I.D. / COLLECTION TIME —/—

PID READING IN CASING (ppm) (initial) 0.0 (vented to) 0.0
PID READING IN BREATHING ZONE (ppm) (initial) 0.0 (vented to) 0.0

STATIC WATER LEVEL (ft btoc) 210.26 TOTAL WELL DEPTH (ft btoc) 242.1
WATER COLUMN (feet) 31.8 TUBING DIAMETER (in) 3/8"

PUMP & TUBING (V) (L) 2.61
5 V (L) 13.05

SAMPLER'S SIGNATURE Dene Scard
Mitchell

Time	Activity	Water Level (ft btoc)	Temp (Deg C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump & Tubing Volumes Purged (L)	Flow Rate (LPM)
1148	Arrived at well	—	—	—	—	—	—	—	—	—	—	—
1203	Begin Purge	—	—	—	—	—	—	—	—	—	—	—
1209	—	311.00	16.84	654	7.29	26.4	4.96	-43.6	Cloudy	0.72	0.27	—
1215	—	311.21	17.03	664	7.18	8.77	2.77	-67.1	clear	1.44	0.54	0.12
1221	—	311.42	17.45	670	7.09	2.59	1.69	-70.6	clear	2.16	0.81	—
1227	—	311.60	16.42	654	7.05	1.63	1.36	-76.7	clear	2.99	1.08	—
1233	—	311.76	15.89	644	7.00	1.28	1.09	-82.0	clear	3.60	1.35	—
1239	—	311.88	15.16	632	6.97	1.23	0.88	-81.8	clear	4.32	1.62	—
1245	—	312.03	15.14	631	6.97	1.20	0.81	-84.9	clear	5.04	1.89	✓
1246	End purge	—	—	—	—	—	—	—	—	—	—	—
1250	Sample	—	—	—	—	—	—	—	—	—	—	—
1300	Vacated well	—	—	—	—	—	—	—	—	—	—	—

Fe+2 (ppm) → 2.0 Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 212.45 FILTER LOT #: →

Comments: _____

PARAMETERS FOR WATER QUALITY STABILIZATION

Temperature $\pm 1^\circ\text{C}$ (1.8°F) Conductivity $\pm 5\%$
pH ± 0.1 Turbidity 5 NTUs



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GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

DATE	<u>3-10-06</u>	SITE NUMBER	<u>5C</u>	PURGING DEVICE	MICROPURGE DEDICATED PUMP		
PROGRAM NAME	<u>B6MP</u>	TRIP BLANK I.D.	<u>VST B1216</u>	SAMPLING DEVICE	MICROPURGE DEDICATED PUMP		
MONITORING WELL IDENTIFICATION	<u>5-MW-17</u>	DUPLICATE I.D. / COLLECTION TIME	<u>— / —</u>	PID READING IN CASING (ppm)	(initial)	<u>0.0</u>	(vented to) <u>0.0</u>
SAMPLE I.D.	<u>VSMW17</u>	STATIC WATER LEVEL (ft btoc)	<u>260.85</u>	PID READING IN BREATHING ZONE (ppm)	(initial)	<u>0.0</u>	(vented to) <u>0.0</u>
• WATER COLUMN (feet)	<u>66-3.88</u>	• TOTAL WELL DEPTH (ft btoc)	<u>327.7</u>				
PUMP & TUBING (ft)	<u>45.0</u>	TUBING DIAMETER (in)	<u>3/8"</u>	SAMPLER'S SIGNATURE	<i>Dave S. J. Mark H.H.</i>		
PUMP & TUBING (V)	<u>3.19</u>	5 V (L)	<u>15.95</u>				

Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump Tubing Volumes Purged	Flow Rate (LPM)
1010	Arrived at well	—	—	—	—	—	—	—	—	—	—	—
1027	Begin Purge	—	—	—	—	—	—	—	—	—	—	0.10
1037	261.63	15.12	48.9	7.09	+200	6.72	-27.0	cloudy	1.0	0.31	1	
1047	262.00	16.21	49.9	7.14	63.0	4.10	-40.9	cloudy	2.0	0.62		
1057	262.38	15.81	48.5	7.10	7.92	2.43	-47.1	clear	3.0	0.93		
1107	262.71	17.10	49.9	7.16	7.03	2.09	-55.9	clear	4.0	1.24		
1117	262.96	16.85	49.6	7.17	6.60	1.67	-59.3	clear	5.0	1.55		
1127	263.25	17.55	50.4	7.16	6.38	1.47	-63.0	clear	6.0	1.86	✓	
1128	End Purge	—	—	—	—	—	—	—	—	—	—	
1130	Sample	—	—	—	—	—	—	—	—	—	—	
1140	Vacated well	—	—	—	—	—	—	—	—	—	—	

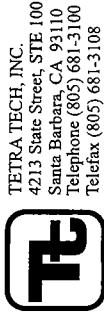
Fe+2 (ppm) — Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 263.38 FILTER LOT # —

Comments:
* Turbidity stable ± 1 NTU over 30 min.

PARAMETERS FOR WATER QUALITY STABILIZATION			
Temperature	±1 C (1.8 F)	Conductivity	±5%
pH	±0.1	Turbidity	5 NTUS

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.



GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

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DATE	<u>3-10-06</u>	SITE NUMBER	<u>SC</u>	PURGING DEVICE	MICROPURGE DEDICATED PUMP							
PROGRAM NAME	<u>B6MP</u>	TRIP BLANK I.D.	<u>V57B1216</u>	SAMPLING DEVICE	MICROPURGE DEDICATED PUMP							
MONITORING WELL IDENTIFICATION	<u>5-MW-18</u>	DUPLICATE I.D. / COLLECTION TIME	<u>V99W635 / 1700</u>	PID READING IN CASING (ppm)	(initial) <u>1.5</u>	(vented to)	<u>0.0</u>					
SAMPLE I.D.	<u>V5MW18</u>	STATIC WATER LEVEL (ft btoc)	<u>203.83</u>	PID READING IN BREATHING ZONE (ppm)	(initial) <u>0.0</u>	(vented to)	<u>0.0</u>					
TOTAL WELL DEPTH (ft btoc)	<u>252.2</u>	WATER COLUMN (feet)	<u>48.4</u>	TUBING DIAMETER (in)	<u>3/8"</u>	SAMPLER'S SIGNATURE	<u>Dave S. S.</u>					
PUMP & TUBING (ft)	<u>2.70</u>	5 V (L)	<u>13.5</u>									
Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (μ mhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump Tubing Volumes Purged	Flow Rate (LPM)
1410	Arrived at well	—	—	—	—	—	—	—	—	—	—	—
1415	Begin Purge	—	—	—	—	—	—	—	—	—	—	0.14
1419	204.19	15.64	825	7.04	2.46	8.75	-21.0	clear	0.56	0.21	—	—
1423	204.39	15.22	824	7.12	2.21	7.41	-24.7	clear	1.12	0.42	—	—
1427	204.50	15.57	831	7.22	1.15	6.21	-32.5	clear	1.68	0.63	—	—
1431	204.65	15.96	838	7.25	4.94	3.73	-43.0	clear	2.24	0.84	—	—
1435	204.82	15.95	835	7.26	6.64	2.56	-49.4	clear	2.80	1.05	—	—
1439	204.95	15.90	833	7.21	6.57	1.96	-54.3	clear	3.36	1.26	—	—
1449	205.15	16.91	832	7.37	4.63	1.35	-62.7	clear	3.72	1.45	—	—
1450	End Purge	—	—	—	—	—	—	—	—	—	—	—
1455	Sample	—	—	—	—	—	—	—	—	—	—	—
1515	Vacated well	—	—	—	—	—	—	—	—	—	—	—

Re+2 (ppm) 0.0 Taken immediately before sampling

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 205.21 FILTER LOT # —

Comments: _____

PARAMETERS FOR WATER QUALITY STABILIZATION

Temperature $\pm 1^\circ\text{C}$ (1.8°F)	Conductivity $\pm 5\%$
pH ± 0.1	Turbidity 5 NTUs

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.



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4213 State Street, STE 100
Santa Barbara, CA 93110
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Telex/fax (805) 681-3108

GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

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DATE	<u>3-9-06</u>	SITE NUMBER	<u>SC</u>
PROGRAM NAME	<u>136 MP</u>	TRIP BLANK I.D.	<u>V5 T8 213</u>
MONITORING WELL IDENTIFICATION	<u>5-MUJ-20</u>	DUPPLICATE I.D. / COLLECTION TIME	<u>5-MUJ-20</u>
SAMPLE I.D.	<u>V5 MUJ 20</u>	TOTAL WELL DEPTH (ft btoc)	<u>242.5</u>
STATIC WATER LEVEL (ft btoc)	<u>204.62</u>	TUBING DIAMETER (in)	<u>1/4"</u>
WATER COLUMN (feet)	<u>37.9</u>	PUMP & TUBING (V) (L)	<u>1.32</u>

Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC ($\mu\text{mhos/cm}$)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump Tubing Volumes Purged	Flow Rate (L/PM)
<u>850</u>	Arrived at well	—	—	—	—	—	—	—	—	—	—	—
<u>918</u>	Begin Purge	—	—	—	—	—	—	—	—	—	—	—
<u>923</u>	<u>205.16</u>	<u>16.02</u>	<u>958</u>	<u>8.03</u>	<u>21.0</u>	<u>6.71</u>	<u>36.1.5</u>	<u>clear</u>	<u>0.60</u>	<u>0.45</u>	<u>—</u>	<u>—</u>
<u>928</u>	<u>205.32</u>	<u>16.11</u>	<u>955</u>	<u>8.17</u>	<u>4.10</u>	<u>4.24</u>	<u>351.1</u>	<u>clear</u>	<u>1.20</u>	<u>0.90</u>	<u>—</u>	<u>—</u>
<u>933</u>	<u>205.46</u>	<u>15.77</u>	<u>951</u>	<u>8.26</u>	<u>1.28</u>	<u>3.27</u>	<u>335.3</u>	<u>clear</u>	<u>1.80</u>	<u>1.35</u>	<u>—</u>	<u>—</u>
<u>938</u>	<u>205.47</u>	<u>16.25</u>	<u>955</u>	<u>8.32</u>	<u>1.05</u>	<u>2.90</u>	<u>322.4</u>	<u>clear</u>	<u>2.40</u>	<u>1.80</u>	<u>—</u>	<u>—</u>
<u>943</u>	<u>205.70</u>	<u>16.22</u>	<u>956</u>	<u>8.33</u>	<u>0.93</u>	<u>2.65</u>	<u>311.2</u>	<u>clear</u>	<u>3.0</u>	<u>2.25</u>	<u>—</u>	<u>—</u>
<u>944</u>	<u>End Purge</u>	—	—	—	—	—	—	—	—	—	—	—
<u>945</u>	<u>Sample</u>	—	—	—	—	—	—	—	—	—	—	—
<u>950</u>	<u>Vacated well</u>	—	—	—	—	—	—	—	—	—	—	—

Fe+2 (ppm) — Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 205.71

FILTER LOT # —
Comments: _____

PARAMETERS FOR WATER QUALITY STABILIZATION			
Temperature $\pm 1^\circ \text{C}$ (1.8°F)	<u>—</u>	Conductivity $\pm 5\%$	<u>—</u>
pH ± 0.1	<u>—</u>	Turbidity 5 NTUs	<u>—</u>

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.



TETRA TECH, INC.
4213 State Street, STE 100
Santa Barbara, CA 93110
Telephone (805) 681-3100
Telefax (805) 681-3108

GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

DATE 3-9-06

SITE NUMBER 5C

PROGRAM NAME B6MP

TRIP BLANK I.D. V5TB1213

MONITORING WELL IDENTIFICATION 5-Mw-21

SAMPLE I.D. V5Mw21M

DUPPLICATE I.D. / COLLECTION TIME —/—

STATIC WATER LEVEL (ft btoc) 59.16

TOTAL WELL DEPTH (ft btoc) 133.1

WATER COLUMN (feet) 73.9

TUBING DIAMETER (in) 1/4"

PUMP & TUBING (V) (L) 0.74

5 V (L) 3.70

Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump Tubing Volumes Purged	Flow Rate (LPM)
1316	Arrived at well	—	—	—	—	—	—	—	—	—	—	—
1321	Begin Purge	—	—	—	—	—	—	—	—	—	—	—
1326	—	59.71	15.75	833	6.96	57.3	1.53	34.4	Cloudy	0.75	1.01	0.15
1331	—	60.04	15.80	880	6.95	56.0	0.59	-51.3	Cloudy	1.50	2.02	—
1336	—	60.27	15.78	874	6.98	42.7	0.33	-83.7	Cloudy	2.25	3.03	—
1341	—	60.51	16.17	906	7.00	31.9	0.21	-98.0	Cloudy	3.00	4.04	—
1346	—	60.73	16.11	906	7.02	26.2	0.18	-104.2	Cloudy	3.75	5.05	—
1347	End Purge	—	—	—	—	—	—	—	—	—	—	—
1350	Sample	—	—	—	—	—	—	—	—	—	—	—
1410	Vacated well	—	—	—	—	—	—	—	—	—	—	—

Pw+2 (ppm) — Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 60.78

FILTER LOT # —

Comments: _____

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PARAMETERS FOR WATER QUALITY STABILIZATION
Temperature ± 1 C (1.8 F) Conductivity $\pm 5\%$ pH ± 0.1 Turbidity 5 NTUs

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.



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4213 State Street, STE 100
Santa Barbara, CA 93110
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Telefax (805) 681-3108

GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

Page 1 of 1

DATE 3-9-06 SITE NUMBER 5C
PROGRAM NAME B6MP TRIP BLANK I.D. V5TB1213

MONITORING WELL IDENTIFICATION 5-MW-23

DUPPLICATE I.D. / COLLECTION TIME 1/—

STATIC WATER LEVEL (ft btoc) 178.04 TOTAL WELL DEPTH (ft btoc) 242.6

WATER COLUMN (feet) 64.6 TUBING DIAMETER (in) 3/8

PUMP & TUBING (V) (L) 2.61 5 V (L) 13.85

		PURGING DEVICE		MICROPURGE DEDICATED PUMP	
		SAMPLING DEVICE		MICROPURGE DEDICATED PUMP	
SAMPLE I.D.	<u>V5MW23</u>	PID READING IN CASING (ppm)	<u>0.0</u>	(initial) <u>0.0</u>	(vented to) <u>0.0</u>
STATIC WATER LEVEL (ft btoc)	<u>178.04</u>	PID READING IN BREATHING ZONE (ppm)	<u>0.0</u>	(initial) <u>0.0</u>	(vented to) <u>0.0</u>
WATER COLUMN (feet)	<u>64.6</u>	SAMPLER'S SIGNATURE	<u>Dan S.</u>		
PUMP & TUBING (V) (L)	<u>2.61</u>				
Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH
<u>9:55</u>	Arrived at well	—	—	—	—
<u>10:01</u>	Begin Purge	—	—	—	—
<u>10:09</u>		<u>178.65</u>	<u>15.60</u>	<u>846</u>	<u>7.81</u>
<u>10:14</u>		<u>178.85</u>	<u>15.77</u>	<u>849</u>	<u>7.64</u>
<u>10:19</u>		<u>179.08</u>	<u>15.93</u>	<u>851</u>	<u>7.59</u>
<u>10:24</u>		<u>179.22</u>	<u>15.92</u>	<u>846</u>	<u>7.58</u>
<u>10:25</u>	End Purge	—	—	—	—
<u>10:30</u>	Sample	—	—	—	—
<u>10:35</u>	Vacated well	—	—	—	—

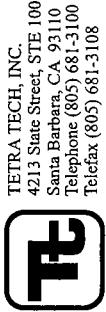
Re+2 (ppm) — Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 179.25

Comments: _____

PARAMETERS FOR WATER QUALITY STABILIZATION		
Temperature $\pm 1^\circ\text{C}$ (1.8 F)	Conductivity $\pm 5\%$	Turbidity 5 NTUs
pH ± 0.1		

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.



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4213 State Street, STE 100
Santa Barbara, CA 93110
Telephone (805) 681-3100
Telefax (805) 681-3108

GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

Page 1 of 1

DATE 13 March 2006 SITE NUMBER 5C
PROGRAM NAME B6mP TRIP BLANK I.D. 005TB121
MONITORING WELL IDENTIFICATION 6-MW-1
SAMPLE I.D. V6mW1 DUPLICATE I.D. / COLLECTION TIME -
STATIC WATER LEVEL (ft btoc) 17.63 TOTAL WELL DEPTH (ft btoc) 16.6
WATER COLUMN (feet) 8.97 CASING DIAMETER (in) 4
WELL VOLUME (V) (gals) 5.83 3 V (gals) 17.49 BAILER BOX # 206

Time	Activity	Water Level (ft btoc)	Pump Depth (ft btoc)	Temp (Deg. C)	EC (µmhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (gals)	Well Volumes Purged	Flow Rate (GPM)
1430	Arrived at well	—	—	—	—	—	—	—	—	—	—	—	—
1430	Begin Purge	—	16	—	—	—	—	—	—	—	—	—	1.0
1435	—	9.43	16	14.56	42.9	6.58	158	5.13	123.3	light Brown	5.0	0.86	1.0
1440	—	9.43	16	14.64	44.1	6.48	111	3.32	121.0	light Brown	10.0	1.72	1.0
1445	—	9.43	16	14.65	44.5	6.46	71.9	3.30	127.9	Brown tint	15.0	2.57	1.0
1450	—	9.43	16	14.58	44.5	6.49	59.6	3.30	130.3	Brown tint	20.0	3.43	1.0
1455	—	9.43	16	14.58	44.6	6.45	51.9	3.45	132.5	slightly cloudy	25.0	4.29	1.0
1500	—	9.43	16	14.55	44.6	6.51	48.6	3.50	130.6	slightly cloudy	30.0	5.15	1.0
1501	END Purge	—	—	—	—	—	—	—	—	—	—	—	—
1510	Sample	8.90	—	13.81	43.4	6.47	180	5.48	107.3	Cloudy	—	—	—
1530	Vacated well	—	—	—	—	—	—	—	—	—	—	—	—

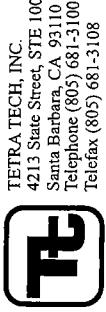
Few2 (ppm) — Taken from first bailer immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 8.70 FILTER LOT #: N/A

Comments: TD = 16.73' (after sampling)

PARAMETERS FOR WATER QUALITY STABILIZATION			
Temperature ± 1 C (1.8 F)	Conductivity $\pm 5\%$	pH ± 0.1	Turbidity 5 NTUs

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background, in the breathing zone will be periodically monitored during purging and sampling activities.



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4213 State Street, STE 100
Santa Barbara, CA 93110
Telephone (805) 681-3100
Telefax (805) 681-3108

GROUNDWATER MONITORING WELL
FIELD DATA LOG SHEET - PURGING

Page 1 of 1

DATE 3-1-06 SITE NUMBER 5C

PROGRAM NAME B6MP TRIP BLANK I.D. VSTB1213

PURGING DEVICE — MICROPURGE DEDICATED PUMP

SAMPLING DEVICE — MICROPURGE DEDICATED PUMP

MONITORING WELL IDENTIFICATION 6-MW-3
DUPLICATE I.D. / COLLECTION TIME — / —
SAMPLE I.D. Y6MW3 TOTAL WELL DEPTH (ft btoc) 244.8
STATIC WATER LEVEL (ft btoc) 221.62 TUBING DIAMETER (in) 3/8"
WATER COLUMN (feet) 23.2 PUMP & TUBING (V) (L) 2.69

PID READING IN CASING (ppm) (initial) 37.9 (vented to) 7.1
PID READING IN BREATHING ZONE (ppm) (initial) 0.0 (vented to) 0.0

5 V (L) 13.45 SAMPLER'S SIGNATURE Dan Seng

Time	Activity	Water Level (ft btoc)	Temp (Deg. C)	EC (µhos/cm)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Color	Volume Purged (L)	Pump Tubing Volumes Purged	Flow Rate (LPM)
1040	Arrived at well	—	—	—	—	—	—	—	—	—	—	—
1052	Begin Purge	—	—	—	—	—	—	—	—	—	—	0.25
1057	221.86	17.00	456	7.00	0.94	8.43	266.9	clear	1.25	0.46	—	—
1102	221.87	17.33	445	6.66	1.17	8.69	278.5	clear	2.50	0.92	—	—
1107	221.88	17.23	443	6.53	0.73	8.83	292.7	clear	3.75	1.38	—	—
1112	221.89	16.86	439	6.49	0.47	8.95	284.3	clear	5.00	1.84	—	—
1117	221.89	16.96	439	6.47	0.43	8.91	284.6	clear	6.25	2.30	—	—
1118	End Purge	—	—	—	—	—	—	—	—	—	—	—
1120	Sample	—	—	—	—	—	—	—	—	—	—	—
1135	Vacated well	—	—	—	—	—	—	—	—	—	—	—

Fe+2 (ppm) — Taken immediately before sampling.

WATER LEVEL (ft btoc) AT TIME OF SAMPLING: 221.89

FILTER LOT #: —

Comments: _____

PARAMETERS FOR WATER QUALITY STABILIZATION		
Temperature	$\pm 1^\circ \text{C}$ (1.8 F)	Conductivity $\pm 5\%$
pH	± 0.1	Turbidity 5 NTUs

Note: All water levels and pump depths are measured from the notch in the top of the well casing. If volatiles are detected above background in the breathing zone during the initial screening, the breathing zone will be periodically monitored during purging and sampling activities.

APPENDIX B

CHAIN-OF-CUSTODY RECORDS

TETRA TECH, INC.
4213 State Street, Suite 100
Santa Barbara, CA 93110
Phone (805) 681-3100
FAX (805) 681-3108

116

SHIPPED TO:
EMAX Labs

1835 West 205th Street

Torrance, CA 90501

06CO95 CHAIN OF CUSTODY RECORD



CLIENT	Vandenberg AFB	ANALYTICAL METHODS		TURN-AROUND TIME:	Standard
PROJECT NAME	BGMP				
PROJECT MANAGER	Kevin McNamara				
TC#	T99105-06				
SAMPLERS (Signatures)					
X	Darlene				
X	R. Dunn				
SAMPLE NO.		DATE	TIME		
V6MW3		3-9-06	1120		
V5MW7B			1215		
V5MW7T			1310		
MATRIX	S = Soil	CONTAINER TYPE:	G = Glass	PRESERVATIVES:	TEMPERATURE <input type="checkbox"/> HANK
TYPE:	W = Water		SS = Stainless Steel	All samples are preserved at 4° C.	EACH COOLER: <input checked="" type="checkbox"/> YES NO
SD = Sediment	E = Encore		P = Plastic	Water samples are preserved as indicated on the sample labels.	
RELINQUISHED BY:	SIGNATURE: <i>Dave Fenerty</i>	SIGNATURE: <i>Darlene</i>	TETRA TECH, INC.	DATE: 3-9-06	TOTAL NUMBER OF CONTAINERS 3
RECEIVED BY:	SIGNATURE: <i>J. P. Cole</i>	COMPANY: <i>Enviro</i>	TIME: 1500	METHOD OF SHIPMENT <input checked="" type="checkbox"/> Fed Ex	
RELINQUISHED BY:	SIGNATURE: <i>J. P. Cole</i>	COMPANY: <i>Enviro</i>	TIME: 0915	SPECIAL SHIPMENT/HANDLING/STORAGE REQUIREMENTS:	
RECEIVED BY:	SIGNATURE: <i>HS</i>	COMPANY: <i>Enviro</i>	TIME:		

T-2-O



TETRA TECH, INC.
4213 State Street, Suite 100
Santa Barbara, CA 93110
Phone (805) 681-3100
FAX (805) 681-3108

SHIPPED TO: _____ EMAX Labs
1835 West 205th Street
Torrance CA 90501

CHAIN OF CUSTODY RECORD

100

Torrance CA 90501

Torrance CA 90501

Offence, CA 90501

$$T = 319^{\circ}C$$

OCC 124

CHAIN OF CUSTODY RECORD

TETRA TECH, INC. SHIPPED TO: EMAX Labs
 4213 State Street, Suite 100
 Santa Barbara, CA 93110
 Phone (805) 681-3100
 FAX (805) 681-3108

100-12
 100-12



Torrance, CA 90501
 1835 West 205th Street

CLIENT	Vandenberg AFB	ANALYTICAL METHODS		TURN-AROUND TIME: Standard	OBSERVATIONS/COMMENTS:
		MATRIX TYPE	CONTAINER TYPE		
PROJECT NAME	BGMP				
PROJECT MANAGER	Kevin McNamara				
TC#	T99105-06				
SAMPLERS (Signatures)	X <i>Devin</i>				
SAMPLE NO.		DATE	TIME		
1	V05TB1218	3/13/06	08:00X		
2	V6M101		15:10X		
3	V5MW4C		10:55X		
MATRIX TYPE:	S = Soil W = Water SD = Sediment	CONTAINER TYPE:	G = Glass SS = Stainless Steel P = Plastic	PRESERVATIVES: All samples are preserved at 4°C. Water samples are preserved as indicated on the sample labels.	
REINQUISITIONED BY:	L. Leonard	SIGNATURE:		COMPANY: TETRA TECH, INC.	DATE: 3/14/06 TIME: 11:05 TOTAL NUMBER OF CONTAINERS: 10 OF 10
REINQUISITIONED BY:	A. Galina	SIGNATURE:		COMPANY: EMAX	DATE: 3/19/06 TIME: 11:05 METHOD OF SHIPMENT: Courier
RECEIVED BY:	A. Galina	SIGNATURE:		COMPANY: EMAX	DATE: 3/19/06 TIME: 12:00 SPECIAL SHIPMENT/HANDLING/STORAGE REQUIREMENTS:
RECEIVED BY:	J. Foster	SIGNATURE:		COMPANY: Leonardo	DATE: 3-14-06 TIME: 14:00
					T-3-D